SCHOOL ARCHITECTURE

HANDY MANUAL
FOR
ARCHITECTS AND SCHOOL AUTHORITIES

THIRD EDITION

SCHOOL ARCHITECTURE

A Handy Manual for the Use of Architects and School Authorities

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BY

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INTRODUCTORY

Modern schoolhouse exterior is, perhaps, as much the reflex of the popular taste in architecture, as exemplified in the average school official, as it is the product of the architect. No doubt schoolhouse exteriors would be the gainer in beauty, simplicity and dignity if the architect had always dared to give full expression to his own ideas.

But, schoolhouse designs are made to be accepted by school authorities rather than to educate public taste. The architect must try to please the taste or fancy of prospective patrons. When he is thrown into close competition, he cannot afford to deal in ideals. He must meet conditions.

It is, therefore, safer to yield to the suggestions of an experienced schoolhouse architect than to insist upon hobbies in the matter of design and form.

WHAT SCHOOL ARCHITECTURE MEANS.

Architecture is the highest of the industrial arts and the most useful of the fine arts. The poet designates architecture as "frozen music."

It is an art, which has for its object to produce effects pleasing to the eye and mind, as well

as to satisfy requirements of convenience and stability. Vitruvius defines its essential qualities as stability, utility and beauty, and the most perfect architecture is that which most completely reconciles these requirements without sacrificing one to the other.

The building of a schoolhouse involves an obligation—an educational obligation, if you please—in that the accepted ideas in beauty, grace and dignity in architecture should be carried out.

The education of the community is affected by its architecture—hence, an edifice dedicated to the cause of education, above all other public buildings, ought to set the pace for taste, simplicity and dignity in the matter of form and design. If we inculcate the rising generation, by worthy example, with a correct taste in architectural expression, the future will bring forth higher achievements in that direction.

THE DUTY OF SCHOOL BOARDS.

The usual excuse, in quarters where schoolhouses are urgently needed, is that the necessary funds are not at command. This, on the face of it, is a most valid excuse. When a board of education or a city council is without sufficient means it necessarily follows that needed expenditures cannot be made.

No one can, however, deny, that a great country

like the United States ought to be able to provide ample school facilities. That permits of no argument. If the public school system is to remain the subject of our boast and pride, we must sustain it properly. The children, who are debarred from its blessings for want of accommodations, can well claim that a crime has been committed against them, the real perpetrators of which not only go unpunished, but even go out uncensured. The difficulties which beset growing communities in adjusting their municipal affairs, the wailing of a penurious tax payer, the periodical cry for economy in public expenditures, etc., furnish the breastworks of defense for weak and shirking officials.

The timely anticipation of public school needs goes a long way towards solving the difficulty. A liberal estimate of the natural growth of a community, wise legislation, sufficient taxation, will obviate crowded and dilapidated schoolhouses.

The final cost of a schoolhouse usually exceeds the original estimate. The timid official remembers the fault-finding tax payer and begins to object to the inclusion of most necessary features of a complete and serviceable structure.

Experience has taught that a fine edifice costs money, but that the average tax payer is willing to contribute his share if the money is wisely spent. The citizen who is disgruntled when the appropriations are made usually lauds the pro-

gressive spirit and patriotism of the authorities when the structure is finished and can make a just claim to architectural beauty and to utility as a schoolhouse.

HOW TO BEGIN.

First, the number of pupils to be accommodated must be decided upon. In reaching this decision there should not only be a consideration of the present number of pupils to be provided for, but the natural increase in attendance from year to year should be anticipated to a reasonable degree.

This done, a site must be chosen and the cost for both building and grounds estimated. Such estimate, while liberal as to a minimum figure, should be consistent with the means likely to be at command of those in charge, and the general local conditions prevailing in the community.

After having determined the three leading quantities, namely, size, site and cost, the real work of planning a building begins. Here the central thought must be adaptability to the work and the government of the school. The questions which must at this stage be settled may be enumerated as follows:

1. Materials of construction.
2. Number of rooms or amount of accommodations.
3. Kind and amount of sanitary appliances.
4. Method of heating.

5. Method and amount of ventilating apparatus.
6. Automatic temperature regulation.
7. Method of arrangement of lighting.

WHEN IS AN ARCHITECT NECESSARY?

The impression prevails in some localities that an architect is not necessary in the planning and construction of a small schoolhouse. This is erroneous.

An architect should always be drawn into counsel—whether the contemplated schoolhouse be large or small. Even small buildings should be planned with a view to beauty, convenience and adaptability. The cost is not materially increased thereby, and the advantage derived from an architect's knowledge and direction are immeasurable.

In brief, it is cheaper in the end to allow a competent architect to plan the school and superintend its construction.

W. G. B.

BRIGHTON HIGH SCHOOL, BOSTON, MASS.
E. M. Wheelwright, Architect.

Architect's Fees.—5 per cent.—viz.: 3 per cent. for plans, 2 per cent. for superintendence. See Architects' Professional Practice on page 91.

Air-washer. There are a number of school buildings and libraries throughout the United States that have installed so-called air-washers. They are designed to cleanse the air from dust and soot before passing into the school rooms. The device consists of a series of baffle plates so arranged, in the inlet duct in the basement, as to arrest every dust particle and then pass the air through several sprays of water, thus thoroughly washing it before passing into the class rooms. Another method consists of the use of a horizontal crate filled with moistened coke through which the air passes before going into the upper ducts. A third and simpler method comprises a series of sprays emanating from perforated water pipes. These pipes are so arranged that the sprays practically form a thin sheet of water.

The air thus manipulated not only becomes cleansed, but also moistened at the same time. The degree of moisture to be infused into the

PHILLIPS BROOKS SCHOOL, BOSTON, MASS

A. Warren Gould, Architect, Seattle, Wash.

school room may be automatically regulated so as to make it equal to the outdoor air. (See paragraph on Humidity.)

Assembly Rooms.—The modern grammar or high school is invariably equipped with an assembly room. This room or auditorium is spacious enough to accommodate all the pupils of the school at one sitting. In the more recent schools the auditorium is placed on the ground floor between two wings of an H shaped building or else forms the center projection of an E shaped building. The galleries are even with the second story of the building. By placing it in this way the auditorium receives light from the sides and the top.

The advantage of thus placing it lies in the fact that stair climbing and dangers arising from stampedes are avoided. Again the auditorium may serve with greater convenience for evening lectures or exercises in which the general public may participate.

Balustrade or Hand Railing.—Should be plain, smooth and of hard wood, to permit an easy grasp with a child's hand. Three inches in diameter is about the right size for a wood hand rail and 1¼ inches is the right size for pipe hand rail, which is by far the best for small children. If the pipe hand rail be used, it should be supported on wrought iron brackets and the ends of the rails returned back to the partition or wainscoting.

WINSHIP SCHOOL, BOSTON, MASS.

Whitman & Hood, Architects

Basement.—Should be high and well lighted —10-foot ceiling. It should be shut off by tinned doors from boiler room, if such is located in basement, fitted with spring butts or door checks. If the building is large, and especially if the heating and ventilating apparatus is to be installed therein, the basement should be 12 feet high.

Blackboards.—Should be 2½ feet from floor in grammar and high schools; in primary schools 26 inches from floor. Top of blackboard should not be higher than 6½ feet from floor. Chalk troughs should be 3 inches wide. Slate blackboards cost about 25 cents per square foot placed on wall; artificial blackboards about 16 cents per square foot. If the latter are used, they should be placed on the wall made with expanded metal lath.

Blackboards should be placed on two walls of the class room only. The space between the windows can rarely be used, especially if the room is on the south side of the building. The glare from the windows puts the space between into a dark shadow, so that the work written there, cannot be seen by the pupils who are in their seats, without unduly straining their eyes. The space within two feet of the corners of the room should not be used for blackboards. It is awkward to reach, and cannot be well seen from all parts of the room.

Boiler and Coal Rooms.—Brick pavement laid on edge or stone flagging should be used. When

SOUTH BOSTON HIGH SCHOOL, BOSTON, MASS.
Herbert D. Hale, Architect.

asphalt is used, it should be laid at least ½ inch thick. Wooden floors in basement should be without air space, laid on sleepers bedded in concrete, with perfect damp proof courses beneath. Floors may also be made with Portland cement. The most satisfactory floors for basements are those covered with rock asphalt (the same as used for street paving) to a depth of ⅜ or ½ inch, on a concrete base. Such floors are known to have been laid for ten years without showing any appreciable wear and without having necessitated the slightest repair.

Ceilings.—The ceilings should be fireproofed by either the use of ornamental, stamped metal plates or plastered with some of the patent hard plasters, such as Adamant, Imperial or Rock Wall, applied to metal lathing. Wooden ceilings are frequently used, but are not recommended.

Chalk Troughs.—The dust which accrues from the crayons used on blackboards may be drawn into the vent flues by means of screened bottoms placed in the chalk troughs. The openings under the troughs must be connected through a flue in the wall with the regular vent flue, thus carrying the dust into the open air.

Chimneys.—Height of chimney and size of flue should receive the maximum in accordance with size of heating apparatus. The size and height of flue should be made as directed by heating contractor.

ROGER WOLCOTT SCHOOL, BOSTON, MASS.

Everett & Mead, Architects.

Class Rooms.—The question of class rooms for primary and grammar has reduced itself to three standard sizes, as follows:

First: 22x32 feet; 40 pupils, 8 rows, 5 each.

Second: 24x32 feet; 48 pupils, 8 rows, 6 each.

Third: 28x32 feet; 56 pupils, 8 rows, 7 each.

Class rooms should have 15 square feet of floor space and 200 cubic feet of air space for each pupil. The sizes of class rooms, as fixed by the best authorities, at 28x32 feet, accommodating 56 pupils, and at 24x32 feet, accommodating 48 pupils. The advantage in adopting the latter size lies in enabling the lighting on one side only (the left side) —the only correct system of lighting. The small size class room permits also an appreciable economy in the construction of the building. Again a class of 48 pupils is nearer the number a teacher should have, as recognized by the highest authorities, than any other. A sound pedagogical policy calls for 40 pupils in a class room. These can be placed in a class room 22x32 feet. The ceiling should not be less than 13½ feet in heighth.

Cloak Rooms.—Should adjoin the class rooms, with outside light, and should be thoroughly ventilated. In case of wet weather, the garments are apt to retain an odor, which is unhealthful. (See Wardrobes.)

Closets.—(See Toilet Rooms.)

Coal.—One cubic foot of anthracite coal weighs

HIGH SCHOOL, SPRINGFIELD, MASS.
Hartwell, Richardson & Driver, Architects, Boston, Mass.

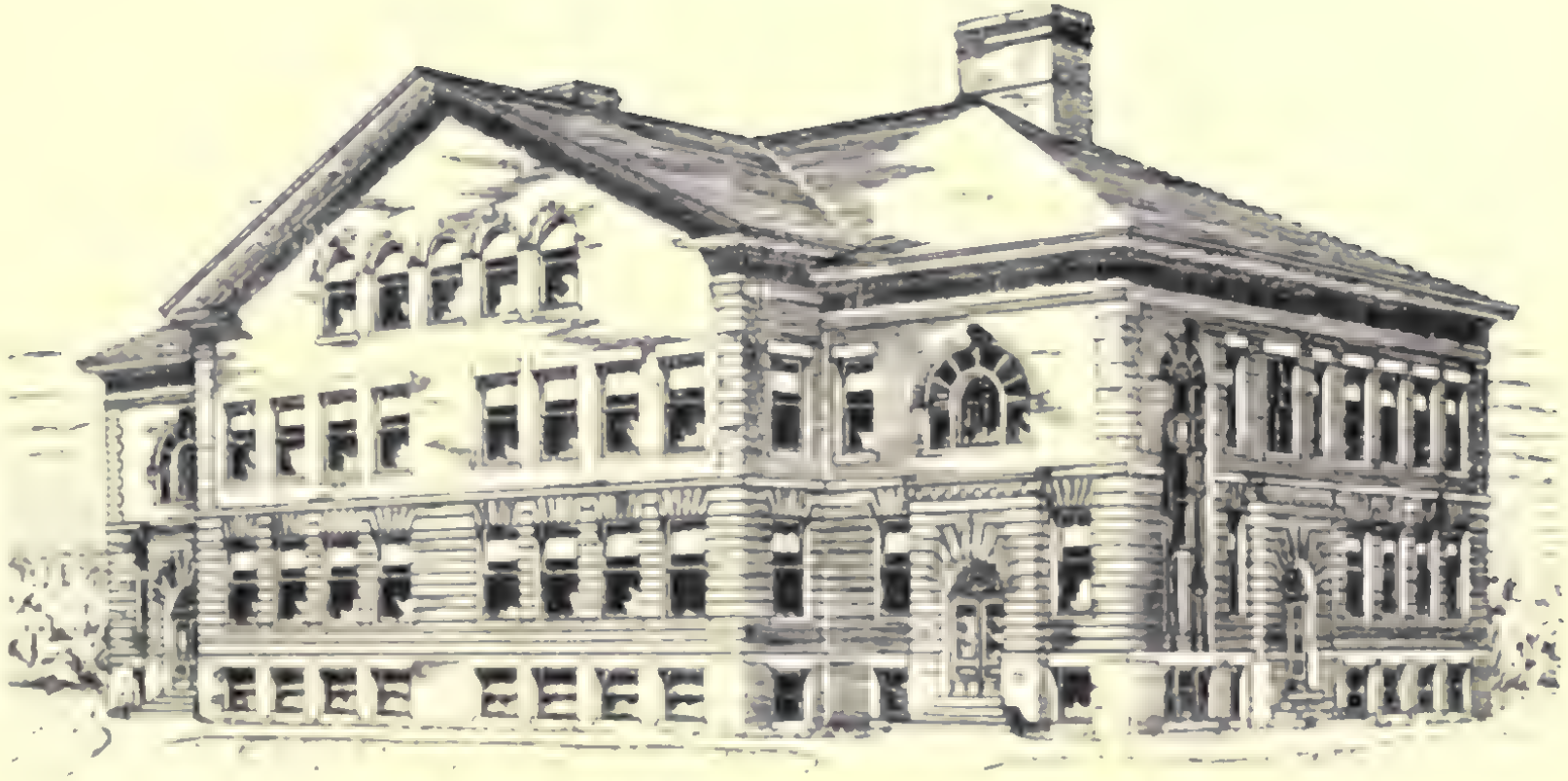
about 56 pounds. One cubic foot of bituminous coal weighs from 47 to 50 pounds. One ton of coal is equivalent to two cords of wood for steam purposes.

Cooking School Tables.—Tables in cooking schools should be 36 inches high. The tables should be equipped with Bunsen burners and movable spits. The latter may be adjusted on iron rods so as to make them movable.

Corridors.—Should be wide and given all the light which the general arrangement of the building may permit. The minimum width should be 11 feet, but 13 feet would be preferable, in larger buildings. They should be shut off from stairways on the ground floor by swinging doors, glass paneled, to avoid draughts and prevent the cold from entering corridors direct.

The use of cement for corridor floors is desirable. Care should, however, be taken that the ridges, if any are introduced, are made as shallow as possible, and to run straight across or lengthwise with the corridor. There is a tendency to run them in diagonal directions in order to produce diamond shaped blocks. In cases of this kind the corridors are not easily swept and the ridges cannot be kept clean without much difficulty. Again, if the ridges are deep it is almost impossible to keep them clean. Creases should be placed longitudinal and at intervals of 6 feet.

Cost.—When a board of education has in con-



SOUTH STREET SCHOOL, WARE, MASS.
Ellsworth & Kirkpatrick, Architects, Holyoke, Mass.

templation the erection of a schoolhouse the question of cost is a leading one. Either it is desired to know what a building, of a certain capacity, will cost, or else how far a stipulated amount of money will go. In either case the answer cannot be given with any degree of accuracy.

This is largely due to the variation in different sections of the country of the labor conditions, the accessibility to building material centers, etc., etc. Again, much depends upon the class of building desired. Some boards want the plainest and cheapest construction obtainable, while others desire a pretentious architecture and some elegance in interior design and finish. Any attempt to give an estimate as to the probable cost must be based upon an average, well designed and well constructed building. An average or ordinary condition must also be assumed as to the facilities at command in securing labor and material and the natural surroundings and condition of the building site.

Per Cubic Foot. The average cost on twenty-five first class grammar and primary school buildings, erected in the city of Boston during the period of 1895 and 1905, was 20 cents per cubic foot. The cost ranged from the lowest, 16 cents, to the highest, 24 cents. In Chicago the cost ranged from 20 to 24 cents, making an average cost of 22 cents per cubic foot. In St. Louis, Mo., the average cost on fifteen school buildings erected

HIGH SCHOOL, PITTSFIELD, MASS.

Brun & Roberts, Architects, New York

during the past seven years was 15½ cents per cubic foot. The average for the three cities is about 19 cents.

Per Pupil. The cost of thirty-three grammar and primary school buildings in the city of Boston erected during the period of 1895 to 1905, ranged from $121.64 to $203.65 per pupil, or an average of $160.00 per pupil. In Chicago, Ill., during a period of three years on seven buildings the cost has averaged $174.00 per pupil; in St. Louis, Mo., during a period of seven years the cost on fifteen buildings has averaged $123.00 per pupil. The average for the three cities is about $152.00.

Per Room. The cost per room for a first-class grammar and primary school ranged from $3,000 to $5,000 per room, in accordance with the variation in the cost of labor and material and the natural conditions of the building site.

Deafening.—Floors and partitions should be made as sound-proof as possible, so that pupils will not be disturbed by noises in adjoining rooms. This can be accomplished by lining with an efficient deafener, which should be lapped at the joints, and not punctured, by nails or otherwise, except where absolutely necessary. This is to prevent the telephonic conduction of sounds through or around the deafener, and make the isolation as complete as possible. Deafeners should be uninflammable, repellant to moths and other insects and vermin, and non-decaying.

NEW PUBLIC SCHOOL, PROVIDENCE, R. I.

Thornton & Thornton, Architects.

Decoration.—In defining the proper colors for a room, the natural light must be considered first. The sunlight breaking into a room which unrestricted power, must be softened and diffused by window shades or curtains.

Sunlight passing through a perfectly white semi-opaque shade, will create a decidedly creamy color leaning towards the yellow orange. The same effect is observable where sunlight is thrown through a milky liquid. In order to overcome this yellowish light, and to produce more of the effect of the north light, the window shades should be colored in a light blueish gray, and thereby make the light in such a room as agreeable and neutral as may be found in a room not exposed to the sunlight.

On the north exposure, the colors can be warm and lean toward yellow and red; on the east, the colors should be less warm, i. e., blended with a little blue; if the color of the hardwood, or other local conditions, do not demand a different treatment.

All primary and secondary colors should be blended to harmonize with woodwork and surroundings. All space not actually needed for blackboards, should be treated in the wall color. Blackboards should not be carried all around the room, but confined to the necessary minimum, in order to allow the wall color to predominate.

The ceiling should be kept light, but never white or chalky. It is never touched by the rays of the

WORTHINGTON HOOKER SCHOOL, NEW HAVEN, CONN.

Brown & Von Beren, Architects

sun, except by reflection from a mirror, or other polished surface; consequently, in the majority of cases it will receive diffused cold light only, and should always be treated in warm tints.

The spectral colors, yellow, orange, red, violet, blue and green, should never be used for ceiling and walls without combining or ornamenting them with softer colors.

Simple, suitable window curtains will give a cozy finish to the school room. Busts, relief panels and framed pictures form important features in school room decoration, but good judgment must be used in their selection. Broad subjects should be chosen for large rooms, or for places more remote from the eye. Details in pictures and sculpture are lost, unless exhibited in places where a close inspection is convenient.

Doors.—All doors should open outward except those into class rooms, which should open in, being thus under the control of the teacher in case of panic. What little loss of life has occurred in the schools of the country has been due to the fact that teachers were unable to control the rush of the children from the rooms during a panic. Vestibule doors should be hung with double swinging spring butts. Outside doors should have checks and springs to make them self-closing.

Drainage.—No site should be selected unless sub-drainage, if necessary, can be assured. Lot should be higher than street or alley. The natural

PUBLIC SCHOOL, No. 31, NEW YORK CITY.

C. B. J. Snyder, Superintendent of School Buildings.

or made grade should be sloped in all directions from the building. This will ensure a dry basement.

Drinking Fountains.—These should be placed in the corridors in niches provided in the walls. It is a mistake to use wash sinks or rather to combine wash sinks with drinking fountains, especially if placed in the corridors. Wash sinks should be confined to the retirement rooms.

Dust Flues.—Some of the more recent school buildings are supplied with flues leading from the top story to the basement for the disposition of the dust sweepings. In larger buildings one of these flues is placed in each wing. The openings are placed in the corridor of every story, flush with the flooring, so that the dust may be readily swept into the opening. These openings are supplied with iron lids or doors placed upon hinges.

Entrances.—The main entrance or entrances should be wide and equipped with a vestibule, where the early comers may find shelter until the school is opened. A recess or portico may also be provided for shelter, in place of a vestibule. To the basements there should be separate entrances for both sexes.

Elevators.—These are needed only in the large school buildings found in the thickly populated districts of large cities. They should be large in size, equipped with safety appliances and in charge of competent and careful men.

NEW PUBLIC SCHOOL, No. 62, NEW YORK CITY.

C. B. J. Snyder, Architect.

Excavations.—In making excavations, care should be taken to see that the soil is suitable for the foundation contemplated. The architect's attention should be called to any indication of quicksand or soft places.

Exposure.—Authorities differ considerably on this subject. There are those who favor north light, because it is more steady. Libraries and drawing class rooms may face the north. Southern exposures is favored because sunlight is most desirable as a disinfectant. Both conditions are desirable, but cannot be secured at the same time. Good sense dictates that sunlight should be had, at least, during a part of the day—thus, making east exposures most desirable. West exposure is the least desirable.

Fences.—If used at all, should be open so as to permit the air to circulate through them and to enable the sunlight to cover the yard. They should be at rear or side of grounds. They should be neat and unclimbable. On north line a stone or brick wall is desirable, as it will offer protection against the northern winds.

Flooring.—Hard wood is more sanitary, more easily swept and kept clean. Maple or Georgia or Florida pine wood makes desirable flooring, Maple is most desirable. The pores of the wood should be thoroughly filled with oil to render the surface smooth and durable. Water should not be frequently used in cleaning, as it brings out the grain

PUBLIC SCHOOL, No. 153, THE BRONX, GREATER NEW YORK.
C. B. J. Snyder, Superintendent of School Buildings, New York City.

of the wood, making it rough and unsanitary. The floors should be swept with dustless brushes, using kerosene or coal oil to deaden and disinfect the dust, and polish the floor. Flooring in boiler rooms should consist of brick pavement. Basements should be laid with asphalt, ¾ inch thick, or with cement. If wooden floors are used in basement, they should be laid on concrete bed. In specifying Georgia or Florida pine, care should be taken to limit the width to 2½ inches, and the quality as being comb grained. Otherwise it is the poorest floor which can be put down.

Floors.—Ought to be double. The under floor may be made of common match fencing or sound dressed boards. (See Deafening.) The under or lining floor should always be laid in diagonal order. This not only stiffens and strengthens the entire floor, but permits the laying of the upper flooring in the correct direction in all cases.

Floor Plans.—No portion of a building should be studied more carefully than the floor plans. Economy of space or rather utility of space and proper lighting should be the prime object in mind. The accessibility of the class room, considering their use, the width of the corridors, the location of cloak rooms, teachers' rooms, etc., should be taken into account. This booklet treats the requisites under their separate headings.

Foundations.—Stone is preferable to brick, unless the latter is a hard clinker or artificial brick.

THE PUBLIC SCHOOL, No. 124, BROOKLYN, N. Y.
C. B. J. Snyder, Superintendent of School Buildings, New York City.

Stone with flat bed should be selected wherever expedient. Concrete for footings, where clean gravel or broken stone can be obtained, is preferable to stone footings. The thickness in all cases should vary in accordance with the weight to be carried.

Gymnasium.—If it is deemed desirable to plan a gymnasium in connection with a new high school building, care should be taken not to place it in the basement. Here all the space below the window line becomes a reservoir for dead air.

In a gymnasium, where breathing is at a maximum, fresh air vents or ducts should be placed at the ceiling as well as near the floors. In basements this condition cannot be secured. Gymnasiums should be placed on top floors where light and air are good. Basements can be utilized to better advantage for manual training apparatus and thus avoid carrying the vibrations through the building.

Height.—No school building should be more than three stories high. Two storied buildings are always preferable. The ceilings should be, at least, 13 feet high, thus, enabling ample window space.

Humidity.—The average percentage of moisture in the outdoor atmosphere is 70 per cent. The average house atmosphere during the months of the year when artificial heat is employed, contains from 10 to 20 per cent. of air moisture. This

THE PUBLIC SCHOOL, No. 127, BROOKLYN, N. Y.
C. B. J. Snyder, Superintendent of School Buildings, New York City.

means a dryness which is greater than that of the deserts at their driest period, during which the moisture is reduced to from 12 to 25 per cent. A mummified and shriveled appearance of the human skin is caused by a dry atmosphere. The ruddy complexion and red cheeks of English men and women are due to air moisture. It is a remarkable fact that while it may require a temperature of 70 degrees to ensure physical comfort—with a relative humidity of 50 per cent. you will be comfortable at 65 degrees of warmth. In other words, if the air moisture is adequate, you will be comfortable in a temperature of 5 degrees less. This, it has been estimated, will make a fuel saving of from 12½ to 15 per cent. (See Temperature.)

The Humidostat.—Is a device which regulates the air moisture in a room and holds it at any desired degree. It is the invention of Prof. Warren S. Johnson of the Johnson Service Company, Milwaukee, Wis.

Janitor's Room.—The janitor should be given a room in the basement in which he may make small repairs and store schoolroom paraphernalia. It should be equipped with a work bench and some shelving. Where the plans permit to do so, conveniently, the room should be accessible directly from the outside.

Lighting.—The proper lighting of a schoolroom is not only one of the most difficult problems

THE PUBLIC SCHOOL, No. 131, BROOKLYN, N. Y.
C. B. J. Snyder, Superintendent School Buildings, New York City.

but also one of the most important. The window area should ordinarily be 1-5 of the floor space. Where the rooms are wider than 22 feet and the light is brought in from one side only, the window area should be at least ¼ of the floor space. The light should come from one side only and pass over the left shoulder. The windows should be close to the ceiling and ought not to be nearer than three feet to the floor. They should not be grouped together, as is frequently done in order to secure an architectural effect, but should be so set as to secure the largest possible diffusion of light for all parts of the class room.

Where a class room is provided with rear windows, which the teacher faces, these should be equipped with dark green glass. This suggestion is made upon the assumption that light is already supplied from one side.

Prism glass may be used to advantage where the proximity and height of surrounding buildings causes dimness. Through the use of prisms a flow of light can be directed into buildings to a considerable distance. The prisms will also equalize and diffuse light throughout a room so that each pupil may enjoy the same intensity of light irrespective of his or her location. The consideration of cost should hardly preclude the use of prism glass, for the first cost is the whole cost, but where artificial light is used the cost is continuous and would soon more than equal the cost

NEW ERASMUS HALL HIGH SCHOOL, BROOKLYN, N. Y.
C. P. J. Snyder, Architect and Supt. of School Buildings.

of prism glass is assured if the work is performed by responsible persons possessing the proper knowledge of methods involved.

Manual Training Rooms.—All manual training apparatus and machinery likely to cause vibration should be placed in basement. Lathes, anvils and benches, if placed on any upper floor are not only apt to cause a vibration through the building while in use, but the noise caused by them is more likely to be carried through the corridors and adjoining rooms.

Material.—The material to go on the exterior of a building is determined somewhat by the accessibility of stone, brick or lumber in your vicinity. If good stone is within easy reach, it may be cheaper than other material, all things considered. A wooden building should be constructed only when brick or stone is too expensive.

Metal Work.—The principal metal work is confined to the heating system. Outside of this, tin or galvanized iron may be used for roofing; also for gutters and down spouts.

Partitions—Movable.—There are instances where movable or sliding partitions are practical. An assembly room, which may be too large, can, in whole or part, be cut up into class rooms. This may be desirable where a school is temporarily crowded.

Principal's Room.—This room should be so located as to be most accessible from all parts of

THE NEW SCHOOL, HASTINGS ON HUDSON, N. Y.
F. L. Hastings, Architect.

the building. If the building is designed for both graded and high school purposes, the principal's room should be nearest the high school department. In a three storied building it should be placed on the second floor.

Rest Rooms.—The more recent high school buildings are usually equipped with a so-called rest room, to be used by pupils or teachers who are suddenly taken ill. This room may be small, but should be well ventilated. A comfortable couch, a pillow, a pair of blankets, two chairs, a small table and a medicine chest should be a part of its equipment.

Roofs.—In shingling roof, tinned or galvanized iron nails should be used. Other nails rust more easily. Slate or tile roofs are desirable and can be had in black, green or red colors. They make a durable and handsome roof. Tile is the more expensive. For flat roof composition, tin or tar and gravel may be used. Do not have high roof for low lot. Avoid cut up or angled roofs on economic grounds—these roofs, unless very securely constructed, may involve considerable expense in repairs. On the whole, the roof should be in keeping with the general design.

Site.—Must be central in point of school population. Corner lot most desirable. Should be away from noise and polluted air. High in order to secure best of drainage. Playgrounds about 30 square feet for each child. While this is the Eng-

EAST HIGH SCHOOL, ROCHESTER, N. Y.
J. Foster Warner, Architect.

lish standard it cannot very well apply to large cities, where ground space is too expensive.

Sites.—(Competitive Purchase)—The custom which prevails more or less throughout the United States in the selection of school sites, is to consider the several pieces of property which are in the market from the standpoint of location and price. The price under this method is usually fixed by the desirability on the one hand to sell and on the other to purchase. This method frequently raises the cost of realty beyond the ordinary market price, unless the school authorities practice great discretion and dealing with the seller.

Sites.— (Condemnation Proceedings)—In the larger communities the practice of instituting condemnation proceedings in order to secure available school sites has been introduced and with gratifying results.

This method has enabled the school authorities to locate school buildings in the actual centers of school population, in sanitary and otherwise desirable locations, and to secure sites at the ordinary market value. Experience has proven that this method saves money over the competitive method and avoids all scandal and public upheavals.

Stair Cases.—Circular stair cases should be avoided. The stair-risers should be 6½ inches, with 13-inch treads, in primary schools. In other

BIOLOGICAL AND DAIRY BUILDING.
New York Agricultural Experiment Station, Geneva, N. Y.
George L. Heins, Architect, Albany, N. Y.

schools, 7-inch riser, with 13-inch treads. In high buildings, with only one set of stairs, they should be fireproof. Rubber or other mats should never be used on any staircase. No school building of two stories or more should have less than two staircases.

The so-called "Duplex" stairways in use in the schools of New York City are by far the most practical. They are of iron construction with asphalt filled stair threads. These stairways are so divided that pupils may descend without interfering with those who may ascend. They are 4 feet wide, permitting two pupils to walk abreast.

Steam.—The average consumption of coal for steam boilers ranges from 6 to 8 lbs. per hour for each square foot of grate surface.

To find the pressure in pounds per square inch of a column of water, multiply the height of the column in feet by .434.

Steam rising from water at its boiling point (212 degrees) has a pressure equal to the atmosphere (14.7 lbs. to the square inch).

To evaporate one cubic foot of water requires the consumption of about 7½ lbs. of ordinary coal, or about 1 lb. of coal to 1 gallon of water.

Teachers' Bookcases.—A bookcase 12 inches deep for the use of the teacher should be provided.

Teachers' Room.—Such a room should be provided wherever six or more teachers are em-

THE FELTON HIGH SCHOOL, NORTH TONAWANDA, N. Y.
Orchard & Joralemon, Architects.

ployed. It should be provided with toilet, a wardrobe, tables and chairs.

Teachers' Wardrobe.—Or case, for the teacher's use, 16 inches in depth, should be provided.

Temperature.—The temperature in all class rooms should be kept uniformly at 70 degrees Fahrenheit. A variation from this is likely to result not only in discomforts, but in an injury to the health of the schoolroom occupants. A room that is too hot is likely to cause perspiration, and a consequent chill when the body is suddenly exposed to a cold outdoor temperature. Near the sea-coast or in a humid climate 68 degrees is better for children than 70 degrees. The economic question which is also involved in the subject of temperature regulation is here worthy of consideration. A schoolhouse should not be overheated any more than it should be underheated. The opening of windows in order to cool off an overheated room, as is so commonly done, means an expensive fuel waste which can easily be checked by an automatic control of the temperature in every room. No janitor can be as exact or prompt as the automatic devices for regulating the temperature without which no school building can be considered to be strictly modern. The Johnson System is the standard found in ninety per cent. of the school and college buildings equipped with temperature-regulating devices. (See Humidity.)

LA FAYETTE HIGH SCHOOL, BUFFALO, N. Y.
Esenwein & Johnson, Architects.

Toilet Rooms.—Modern schoolhouse plans provide for toilet rooms on every floor, as being the most desirable. These should be so arranged as to secure a complete separation of the sexes, built entirely sanitary, using no wood in floors or partitions. If placed in basement, as is now customarily done in smaller buildings, they should be accessible from the playroom. The seats should be hidden from view by screened partitions. It is not necessary, however, or even desirable, that the several seats be enclosed by doors. Partitions dividing the seats is sufficient.

In planning flooring material for closets, we caution against the use of cement. Where urine comes into contact with cement the stain and odor can never be removed. The chemical action which follows the combination of cement and urine tends to retain the unpleasant qualities of the latter.

The most practical substance to use for closet floors is soft asphalt. All soil stains and odors are readily and effectually removed by the application of water.

Trees.—Are desirable where the grounds are ample. They should be located at least 30 feet from the schoolhouse.

Ventilation.—Thirty cubic feet per minute, per pupil, or 1,800 cubic feet, per hour, is the accepted standard for schoolroom ventilation.

Walls—Plastered.—Should be painted in oil under blackboards, where not wainscoted. Above,

THE MASTEN PARK HIGH SCHOOL, BUFFALO, N. Y.
M. E. Beebe & Son, Architects.

they may be calcimined or in water colors. Ceilings always in dead white. Walls in soft gray tint or other subdued shades. The tint of the side walls should be dependent entirely upon the exposure. For instance, a grey tinted wall for a northern exposure would be extremely depressing.

Wardrobes.—Should have outside light, and should be warmed and ventilated. Width should be not less than 4 feet. Hooks for hanging clothes are placed 5 feet from the floor in grammar schools, 4 feet in primary schools, or the different heights may be attained in the same wardrobe. The hanging space is 25 feet for 50 pupils. Stand for umbrellas and overshoes, and shelves for lunch baskets, should be provided.

For high schools and colleges the locker system is recommended. The lockers introduced in recent years are constructed of strong wire netting and furnished with keyless locks for the use of individual pupils. The lockers are either placed in the corridors, in regular locker rooms provided on each floor, or in the basements. This system saves the expense of providing separate wardrobes for each class room and is also economical in the matter of space.

Windows.—Window space should be 1-5 of the floor space and in unfavorable light fully ¼ of floor space. Darker rooms can be brightened by glass prisms. The top of windows should come as near the ceiling as the casing, which should not

PUBLIC SCHOOL No. 61, BUFFALO, N. Y.
Howard L. Beck, Architect.

exceed 6 inches in width, will permit. It has been held that windows should be evenly distributed and not grouped in order to secure a better diffusion of light. Authorities are, however, coming more and more to realize that the shadows thrown by piers between windows are extremely injurious to the eyesight of children. Windows should not come nearer the floor than 3 feet. Double glazing will save thirty-three per cent. of heat, which is lost through a single glazed sash.

Window Shades.—Adjustable fixtures should be obtained so that the light may be secured from the top or bottom as may be necessary.

Wood Finish.—There should be no radical departure from the natural wood finish. These finishes always look well, if oak, birch or pine lumber is used for the interior wood work. If a cheaper material is used, requiring a paint finish, the color should be in light gray or yellow tint. If soft or yellow pine is to be made in natural finish, the first coat should be shellac, in order to prevent it from becoming dark with time. Deep cut moulding should be avoided, as these are dust catchers.

NEW PUBLIC SCHOOL, No. 24, BUFFALO, N. Y.

Chas. D. Swan, Architect.

HEATING AND VENTILATING

The heating and ventilation of buildings are so intimately connected that they cannot be treated separately. With a few exceptions in the extreme south, every school building in the United States needs some form of heating, and some form of ventilation. Heating and ventilation are the very heart and vitals of a building, because if both are not properly done the building, however it may be constructed otherwise, is an absolute failure for the purpose for which it was intended.

Methods of Heating.—There are only three methods of heating of school buildings which can be considered at all, for heating a building by stoves is absolutely out of the question at the present time, except in buildings of two or three rooms in country districts. Stoves give absolutely no ventilation, and ventilation is a prime requisite, as we state above. There remain, therefore, three possible ways of heating—by hot air furnaces, by steam and by hot water.

Furnace Heating.—Furnaces give good results as to heating and ventilating or they may be absolute failures in either or both particulars, depending entirely on the style of furnaces and the method of installation. Upright or house fur-

THE BRUSHTON SUB-DISTRICT SCHOOL, PITTSBURG, PA.

Milligan & Miller, Architects, Wilkinsburg, Pa

naces cannot give good results, in fact are always failures in every respect. The furnace should be horizontal and all cast iron. The flues for conveying the warm air into the rooms should be of brick and set to one side of the furnace, and of a size sufficient to supply the rooms to which they lead.

It must be remembered that in order to get air into a room some must be taken out, hence vents should be placed in several parts of the room at the floor and provision made for drawing the cold and foul air through them and out of the building. The foul air should enter the ventilating stack at the bottom and no other openings should be made into this stack or its efficiency will be destroyed. Foul and cold air are heavier than fresh air so that some method for forcing this air from the building must be provided. In all cases the ventilating stack should extend above the roof.

In buildings of eight rooms or more a fan should be introduced to force air into the building through the furnace chamber, but care must be taken that the furnace is of sufficient capacity to warm the air taken in.

To get successful results with furnaces they must be installed by firms making a specialty of schoolhouse heating and who have a wide reputation for that particular work.

Steam Heating.—There are three methods by which a building may be heated by steam: First,

THE SIERRETT SUB DISTRICT SCHOOL, PITTSBURG, PA.
Edward J. Carlisle & Co., Architects.

by *direct radiation,* by which all the heating is through the means of radiators, or coils. Such heating is as bad as a stove, and should never be tolerated for an instant, as it supplies no ventilation. Second, by direct radiation with ventilating ducts, i. e., the use of radiators or coils in the room to furnish the heat, with a system of ventilating pipes, which furnish sufficient air for the room at a temperature of 68 or 70 degrees. This is a good form of heating, and the fact that the direct radiation in the room secures an abundance of heat at all times, and a proper amount of tempered air is also furnished throughout the ventilating flues, the system is complete. The third form, purely indirect, is where all of the heat and all of the ventilation is given from the same flue. This is called an indirect method, there being no radiators in the room. This system is used a great deal in the middle west, and seems to be well liked by those who have used it largely. In this case there must be both tempered and hot air, so that when the room arrives at 70 degrees the air can be modified so as to keep the room at the right temperature, but at the same time not to restrict the ventilation.

Heat Economy.—Where buildings are mechanically ventilated the exit duct or ducts should be provided with a damper or dampers which should be closed when the ventilation is not required, for instance, before and after school hours.

THIRD WARD SCHOOL, ALLEGHENY, PA.

F. C. Sauer, Architect.

The heat can thus be confined to the building after the fires have been banked.

Natural Ventilation.—Natural ventilation is ventilation caused by the heating of the air of the building, which, making it lighter, causes it to rise into the room, and from the room out at the roof. While this form of ventilation is better than none, it is very unreliable, and should never be used in a building where there are six or eight rooms or more, and where mechanical ventilation can be afforded.

Mechanical Ventilation.—Mechanical ventilation means the forcing of air into the room by means of fans or blowers. It is well known that a fan or blower of a certain size, with a certain number of revolutions, will force a certain amount of air, consequently the amount of air forced into the room remains the same at all times, whatever the direction of the wind outside, or whatever the outside temperature may be. These fans may be run by a low pressure of steam from the boilers, and the exhausts from the general engine run into the pipes. By that method the cost of running the fan is almost nothing. Fans are sometimes run by electricity, gas engines or water motors.

The Amount of Air Required for Ventilation.—By a great many experiments it has been determined that the lowest possible amount of air which should be furnished is 30 cubic feet per

NEW HIGH SCHOOL, ALTOONA, PA.

Robinson & Winkler, Architects, Pittsburg, Pa.

minute, or 1,800 cubic feet of air per hour for each occupant in the room. A less quantity than this is unhealthful, and a greater quantity is wasteful.

Temperature Regulation —Every schoolhouse equipped with a heating system either of steam, hot water or hot air should be supplied with automatic temperature regulation. School authorities who have given the subject no attention, frequently confound temperature regulation with ventilation. The latter deals with the supply of fresh air while the former controls the temperature and prevents the rooms in a school from becoming too hot or too cold. The advantages derived in temperature control or regulation are two fold.

First, by holding the temperature in a schoolhouse, at say 70 degrees, all waste of fuel is prevented and consequently a considerable saving in money is effected. Thousands of dollars have been wasted in a single schoolhouse by overheating it and securing a cooler temperature by opening the windows. Every particle of excess heat which goes out of the window is an actual waste of the public funds. If the outdoor temperature is 30 degrees it will require 40 degrees of heat to bring the schoolroom temperature up to 70 degrees. If, however, the outdoor temperature is 50 degrees only 20 degrees of heat are required to ensure the comfort of the schoolroom. A reliable system of temperature control will furnish the

THE HIGH SCHOOL, JOHNSTOWN, PA.

George Wild, Architect.

exact amount of heat required and avoid all excess consumption of fuel and consequently avoid all extravagance in this direction.

Second, by keeping the class rooms at an even temperature the health and comfort of teachers and pupils are promoted. A class room that is too cold causes physical discomforts which may result in ill health. A class room that is too hot is even worse. The average teacher will resort to an open window for relief. The draughts from these open windows are certain to bring on coughs and colds which only too frequently end in throat or pulmonary troubles. The cause of education is as much promoted by hygienic surroundings and physical comfort of pupils as by teachers and text-books. Hence automatic temperature regulation is regarded by the highest authorities as a necessity. A schoolhouse without it cannot be considered to be strictly modern.

The Johnson System is the standard and may be found in ninety per cent. of the school and college buildings now equipped with any system of temperature control.

THE HIGH SCHOOL, CHESTER, PA.

Seymour Davis, Architect, Philadelphia, Pa.

SCHOOL HOUSE PLANS

General specifications to be prepared and submitted by Boards of Education, inviting architects to submit plans. These may prove suggestive in formulating specifications for larger or smaller buildings, omitting or adding such items as the school in contemplation may require:

PLANS

Competitors are required to submit the following plans:

A plan showing the location on the lot, which shall be drawn to the scale of one-sixteenth inch to the foot.

A plan of each story and of the basement.

Four elevations, one of which may be shaded.

Two sections, through auditorium; one north and south and one east and west.

All plans, except the first mentioned, shall be drawn to the scale of one-eighth inch to the foot.

(Here follow some directions to the architects, regarding the details of the preparation of their plans, which are not of interest except to them.)

The plans shall not be shown to any of the competitors nor to the public until the decision has been announced.

FIRST WARD, No. 2 SCHOOL, WILKINSBURG, PA.

Milligan & Miller, Architects

One design only shall be submitted by each competitor.

Competitors may submit such additional plans for said design as they choose.

A brief typewritten description should accompany the plans, calling attention to points of special importance.

The object of the competition is to select a general scheme of arrangement and design, and in making their selection, the board will consider economy of construction, and convenience of arrangement, as well as merit of plans.

The competing architects will submit, with their plans, a careful estimate of the cost of erecting the building according to their respective plans, and this must be accompanied with a certificate of a reputable builder that the building can be erected according to such plans for a sum not exceeding $.....; also a descriptive specification of the material proposed to be employed, and the mode of construction, and of heating and ventilating to be adopted.

The plans will be examined by the board, which reserves the right to reject any or all of said plans.

The board will then make its decision as to which plan, if any, is the best, and if any one plan is so selected will appoint the author thereof the architect of the building.

HIGH SCHOOL, SCRANTON, PA.

Little & O'Connor, Architects, New York City.

The architect so appointed will make the detail plans and specifications, and exercise such inspection and superintendence, and shall render such other assistance in the construction of said building as may be required of him.

The superintendent employed by the architect shall be approved by the board.

In full compensation for these services, in case said building is erected, including all changes and alterations in the same as hereinafter specified, he shall be paid a commission of 5 per cent. upon the contract price.

The authors of the five plans considered by the boards as next in merit to the one selected shall receive the sum of ————

All unaccepted plans will be promptly returned to their authors.

A plan and its author will be excluded from the competition if any attempt is made, directly or indirectly, by its author to unduly influence the decision of the board; if it is sent in after the limit of time named in the invitation, or if, in any particular, it violates the conditions of the competition.

The plans are to be sent or delivered on or before .....to the secretary of the board, at or before 3 p.m., at which time the board will meet and hear a personal explanation from each architect or firm of

NEW HIGH SCHOOL, YORK, PA.

B. F. Willis, Architect.

architects submitting plans. Such explanation not to be limited to a less time than 20 minutes to each.

The board reserves the right in accepting any plan or plans so submitted to have such changes and alterations made in said plan by the architect or architects, without any additional compensation from said board, as said board may deem for the best interests of said school district.

SITE

The site of the proposed building is the block of ground bounded on the north by..... street, on the east by.....street, on the south by.....street, and on the west by.....street.

The frontage on the several streets is shown on the blueprint enclosed, as is also the established grade of the streets surrounding it with the present surface of the ground on said block, with the locations of the present buildings thereon.

As the block is surrounded by prominent streets it will be necessary that the four elevations be of the same materials, that is, common brick cannot be used on either.

The two most prominent streets are..... and .....streets, ...and .....being cross streets and occupied by residences.

FIRST WARD SCHOOL, BELLEVUE, ALLEGHENY CO., PA.
W. J. Shaw, Architect, Pittsburg, Pa.

We believe it would be of advantage to architects competing to visit our city and inspect the grounds and surroundings.

REQUIREMENTS

The sum available for the complete erection of this building, exclusive of heating, temperature regulation, ventilating, plumbing, electric wiring, gas piping, architect's fees, movable furniture and equipment of the several laboratories, is $....., and all designs must be made with reference to this limit.

The building shall be well lighted, and it shall be heated, ventilated, and appointed after the most approved methods, and, in every respect, a building of the first class.

It shall be heated by.....and ventilated by the fan system.

It shall be supplied with the Johnson System of automatic temperature regulation or its equal.

The building shall be supplied with the necessary water pipes. It shall also be supplied with gas pipes, and wired, so that it can be lighted with gas or electricity.

The exterior of the building shall be of pressed brick and stone, combined.

The building shall consist of a well-lighted basement and three stories above.

The stairway shall be of fire-proof construction

THE JACOB TOME INSTITUTE, PORT DEPOSIT, MD.

Boring & Tilton, Architects, New York City.

from the basement throughout. All hall floors shall be either concrete or tile.

The building must be designed to accommodate at least.....pupils.

The first and second stories shall be at least 14 feet high in the clear; and the third story shall be nowhere less than 9 feet high on the vertical walls; and the level part of the ceiling shall be at least 13 feet high.

The building must be supplied with fire escapes.

There shall be water closets located on each floor.

An elevator for supplies is desirable, and there should be a janitor's closet on each floor.

There shall be 1,200 lockers located in the halls.

The building is to contain at least the following rooms:

Three study rooms, to seat 400 each; prefer one on first floor and two on second; or four study rooms, to seat 300 each; prefer two on first floor and two on second.

Six recitation rooms, to seat 20 each.

Twelve recitation rooms, to seat 30 each.

Twelve recitation rooms, to seat 40 each.

There should be a storage closet in each room.

Auditorium; to seat from 1,200 to 1,500; lower floor if possible.

Manual training room; basement preferred; say south side where ground is lower; 50 pupils.

Cooking room; 40 pupils; third story preferred.

NEW EASTERN FEMALE HIGH SCHOOL, BALTIMORE, MD.

Simonson & Pietsch, Architects.

Lunch room; third floor, good size.

Two rest rooms, for boys and girls, adjoining lunch room preferred.

Gymnasium, with shower bath, for boys and girls, separate; attic or basement.

Commercial department for business and shorthand; 50 pupils.

Typewriting room adjoining commercial department; 20 pupils.

Two chemical laboratories, with small store rooms; 28 pupils each.

One geological laboratory, with small store room; 28 pupils.

Two physical laboratories, with small store rooms; 28 pupils each.

Two biological laboratories, with small store rooms; 28 pupils each.

Mechanical drawing, 40 pupils; north light if possible.

Free hand drawing; 50 pupils.

One lecture room on floor with laboratory; if possible raised seats for say 50 pupils.

Two lecture rooms, level floor, to seat 40.

Library, with reading room adjoining; second floor preferred.

Principal's office, with private room, first floor.

Teachers' room, ladies.

Teachers' room, gentlemen.

COLORED MANUAL TRAINING SCHOOL, WASHINGTON, D. C.
Waddy B. Wood, Architect.

THE LAW OF PENNSYLVANIA

One of the most practical laws governing the construction of public school buildings now upon the statute books of any state was enacted by the state legislature of Pennsylvania in 1905. It reads as follows:

Entitled an Act for the Purpose of Governing the Construction of Public School Buildings, in order that the Health, Sight and Comfort of all Pupils may be Properly Protected:

Whereas, it is of great importance to the people of this Commonwealth that public school buildings hereafter erected by any board of education, school trustees or school directors, shall be properly heated, lighted and ventilated.

SECTION 1. *Be it enacted by the Senate and House of Representatives of the Commonwealth of Pennsylvania in General Assembly met and it is hereby enacted by the authority of the same;* That in order that due care may be exercised in the heating, lighting and ventilating of public school buildings hereafter erected, no schoolhouse shall be erected by any board of education or school district in this State, the cost of which shall exceed four thousand dollars ($4,000.00), until the plans and specifications for the same shall show,

NEW HIGH SCHOOL, SUMPTER, S. C.
Chas. C. Wilson, Architect, Columbia, S. C.

in detail, the proper heating, lighting and ventilating of such building.

SECTION 2. Light shall be admitted from the left, or from the left and rear of class rooms, and the total light area must, unless strengthened by the use of reflecting lenses, equal at least twenty-five per centum of floor space.

SECTION 3. Schoolhouses shall have in each class room, at least fifteen square feet of floor space and not less than two hundred cubic feet of air space per pupil, and shall provide for an approved system of indirect heating and ventilation, by means of which each class room shall be supplied with fresh air at the rate of not less than thirty cubic feet per minute for each pupil and warmed to maintain an average temperature of seventy degrees Fahrenheit during the coldest weather.

SECTION 4. All acts or parts of acts inconsistent herewith are hereby repealed.

NEW HIGH SCHOOL, PORT ARTHUR, TEX.
Wagner & Manning, Architects, Denver, Colo

JANITOR SERVICE

After a schoolhouse has been erected its advantageous use rests largely upon the competency of the janitor, custodian, or caretaker. The most skillful work of the architect, heating and ventilating engineer may suffer in efficiency through the laxity and incompetency of the custodian.

No heating and ventilating system can render satisfactory service unless its mechanism is understood and the rules governing its operation are complied with. No automatic temperature regulating device can render its best service in the way of economy in fuel consumption and physical comfort unless it is properly cared for. The best features in the interior planning of the school, in the direction of utility and sanitation, may be rendered useless by an ignorant and careless janitor.

The janitor should be at least thirty years of age, married and reside within convenient distance of the school. He should be a man of correct habits, morally clean, understand the construction and manipulation of a heating system and be able to make all ordinary repairs in or about a school building. He should also be thoroughly familiar with the ventilating apparatus and the automatic regulation of temperature, throughout the building.

HIGH SCHOOL, LITTLE ROCK, ARK.
Frank W. Gibb, Architect.

The rooms should be swept once a day at the close of the afternoon session and the desks and seats wiped with a damp cloth in the morning.

In the winter time all the rooms in the building should be kept warm to the required degree.

The janitor shall remove the snow from all yards, pavements and passages within a reasonable time. Also keep fire escapes clear and clean at all times.

He should keep a record of movable articles of furniture and equipment as of general school supplies.

He should see to it that all closets and lavatories are kept clean and in repair.

He should be clothed with police powers in dealing with prowlers and tramps, and in keeping outsiders from interfering with the good order in the building and on the grounds.

The janitor should be under the immediate direction of the principal of the school.

THE NEW McKINLEY SCHOOL, OKLAHOMA CITY, OKLA.

Williams & Saylor, Architects, Oklahoma City, Okla.

ARCHITECTS' PROFESSIONAL PRACTICE

The following is the schedule of minimum charges together with a statement of the professional practice of architects deemed usual and proper, as adopted by the American Institute of Architects:

For full professional services (including supervision) five per cent. upon the cost of the work.

For partial service, or in case of the abandonment or suspension of the work, the charges for partial service are as follows:

Preliminary studies, consisting of drawings such as ground plan, one upper floor plan and elevation or perspective view of exterior, special fee according to the magnitude of the work.

For full set of preliminary drawings, including the above, and such additional elevations, plans and sections as are necessary to illustrate the general scheme without working drawings, and including one revision to correct the same, one (1) per cent.; preliminary studies, general working drawings and specifications, two and a half (2½) per cent.; preliminary studies, general working drawings, specifications and details, three and a half (3½) per cent.

NEW FRUITLAND SCHOOL, CLEVELAND, OHIO.
F. S. Barnum, Architect.

For work that costs less than $10,000, or for monumental and decorative work, and designs for furniture, a special rate in excess of the above.

For alterations and additions, an additional charge to be made and also an additional charge to be made for surveys and measurements incident thereto.

An additional charge to be made for alterations and additions in contracts and plans, which will be valued in proportion to the additional time and services employed.

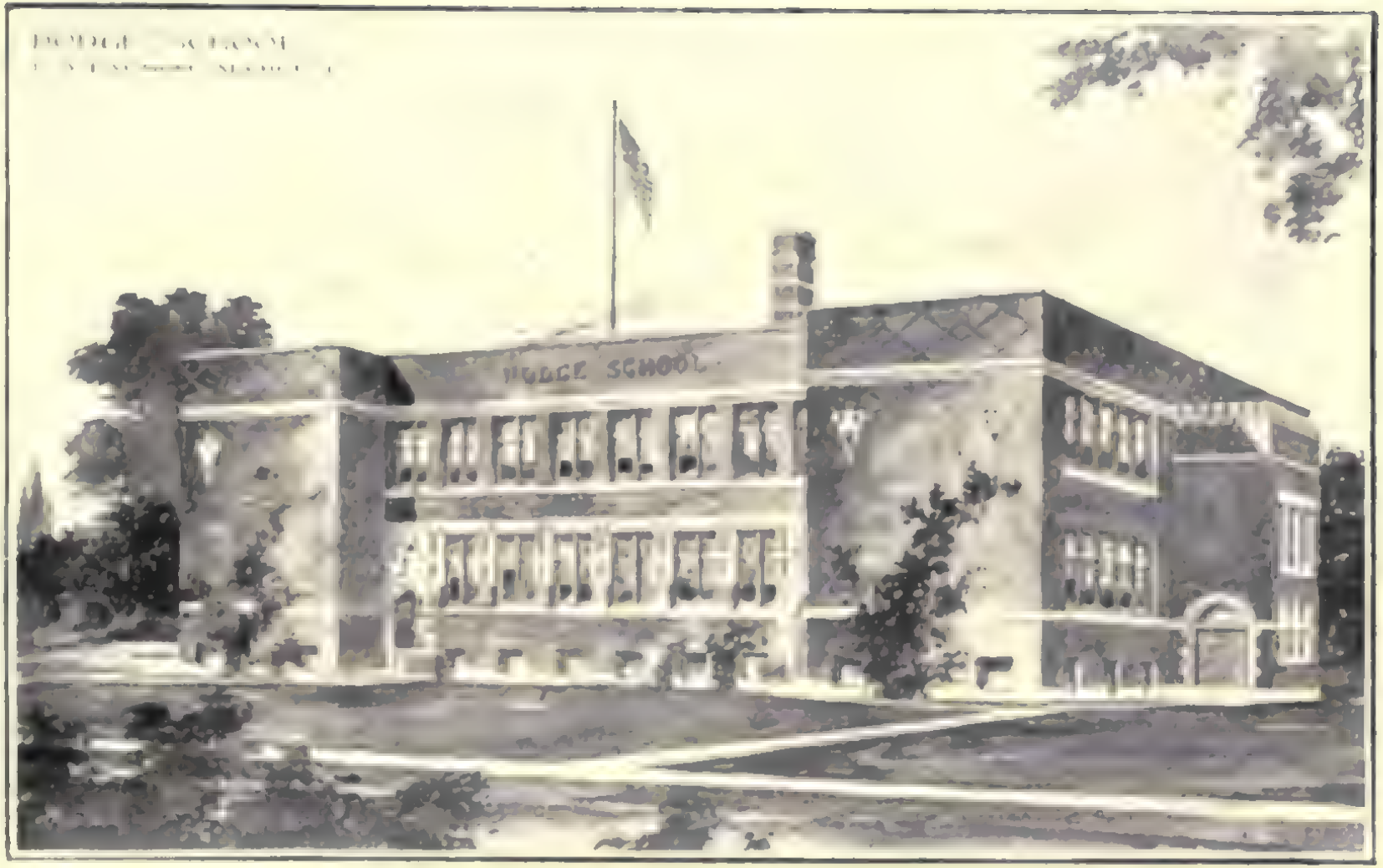
Necessary traveling expenses to be paid by the client.

Time spent by the architect in visiting for professional consultation, and in the accompanying travel, whether by day or night, will be charged for, whether or not any commission, either for office work or supervising work, is given.

The architect's payments are successively due as his work is completed, in the order of the above classifications.

Until an actual estimate is received, the charges are based on the proposed cost of the work, and the payments are received as installments of the entire fee, which is based upon the actual cost.

The architect bases his professional charge upon the entire cost, to the owner of the building, when completed, including all the fixtures necessary to render it fit for occupation, and is entitled to extra



NEW HODGE SCHOOL, CLEVELAND, OHIO.

F. S. Barnum, Architect.

compensation for furniture or other articles designed or purchased by the architect.

If any work or material used in the construction of the building be already upon the ground, or come into the possession of the owner without expense to him, the value of said material or work is to be added to the sum actually expended upon the building before the architect's commission is computed.

Supervision of Works.—The supervision or superintendence of an architect (as distinguished from the continuous personal superintendence which may be secured by the employment of a clerk of the works) means such inspection by the architect, or his deputy, of a building or other work necessary to ascertain whether it is being executed in conformity with his designs and specifications or directions, and to enable him to decide when the successive installments of payments provided for in the contract or the agreement are due or payable.

He is to determine in constructive emergencies, to order necessary changes, and to define the true intent and meaning of the drawings and specifications, and he has authority to stop the progress of the work and order its removal when not in accordance with them.

Clerk of the Works.—On buildings where it is deemed necessary to employ a clerk of the works, the remuneration of said clerk is to be

WILLSON SCHOOL, CLEVELAND, OHIO.

F. S. Barnum, Architect.

paid by the owner or owners, in addition to any commission or fees due the architect. The selection or dismissal of the clerk of the works is to be subject to the approval of the architect.

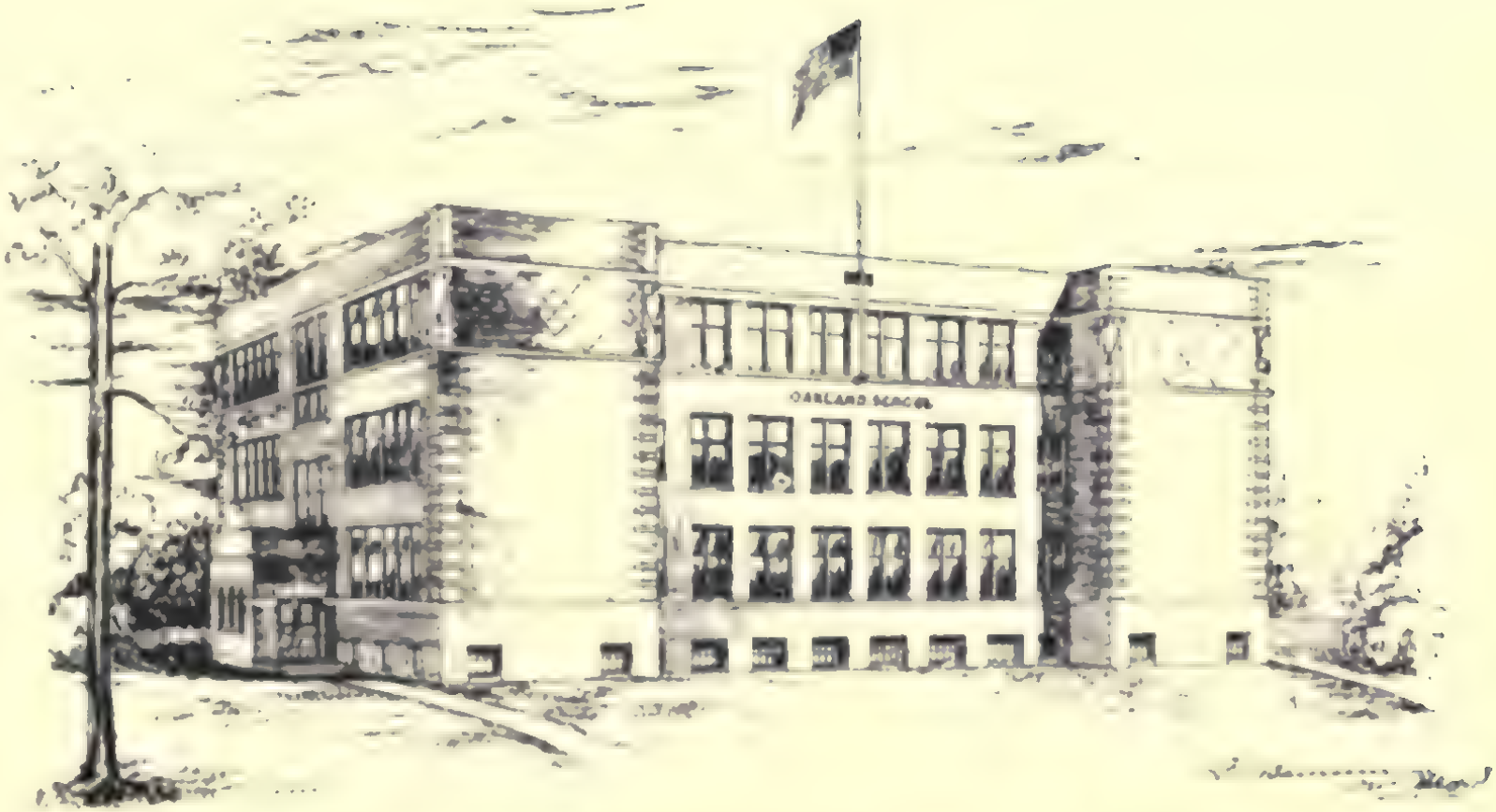
Extra Services. —Consultation fees for professional advice are to be paid in proportion to the importance of the questions involved, at the discretion of the architect.

None of the charges above enumerated cover professional or legal services connected with the negotiations for site, disputed party walls, right of light, measurement of work, or services incidental to arrangements consequent upon the failure of contractors during the performance of the work. When such services become necessary they shall be charged for according to the time and trouble involved.

Drawings and specifications, as instruments of service, are the property of the architect.

Expert Services.—Where heating, ventilating, mechanical, electrical, and sanitary problems in a building are of such a complicated nature as to require the assistance of an engineer, the owner is to pay for such assistance as the architect may require. Chemical and mechanical tests, when required, are to be paid by the owner.

Soliciting Patronage.—The attempt to secure work by offering professional services at a less rate of compensation than another architect, is unprofessional conduct.



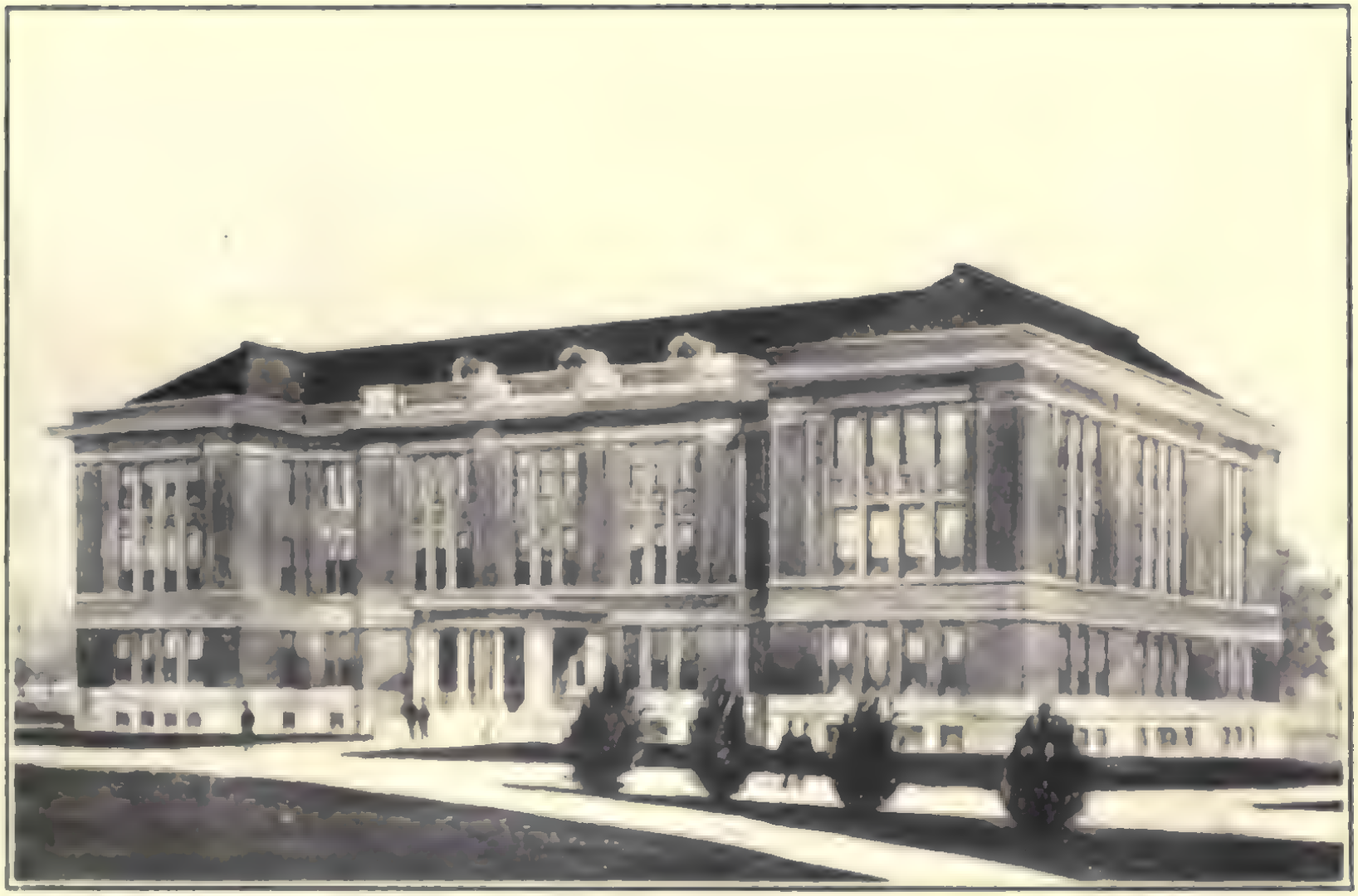
NEW OAKLAND SCHOOL, CLEVELAND, OHIO.

F. S. Barnum, Architect.

THE DOAN SCHOOL, CLEVELAND, OHIO.
F. S. Barnum, Architect.

SCHOOL OF MINES, OHIO STATE UNIVERSITY.
Frank L. Packard, Architect, Columbus, Ohio.

CHEMISTRY BUILDING, OHIO STATE UNIVERSITY, COLUMBUS, O.
Peters, Burns & Pretzinger, Architects, Dayton, O.



PHYSICS BUILDING, OHIO STATE UNIVERSITY, COLUMBUS, O.
Peters, Burns & Pretzinger, Architects, Dayton, O

NORTH HIGH SCHOOL, COLUMBUS, O.

David Riebel, Architect.

NEW SOUTH HIGH SCHOOL, COLUMBUS, O.

David Riebel, Architect.

NEW SCHOOL BUILDING, EVANSTON, CINCINNATI, OHIO.

E. H. Dornette, Architect, Cincinnati, Ohio.

HYDE PARK SCHOOL, CINCINNATI, OHIO.

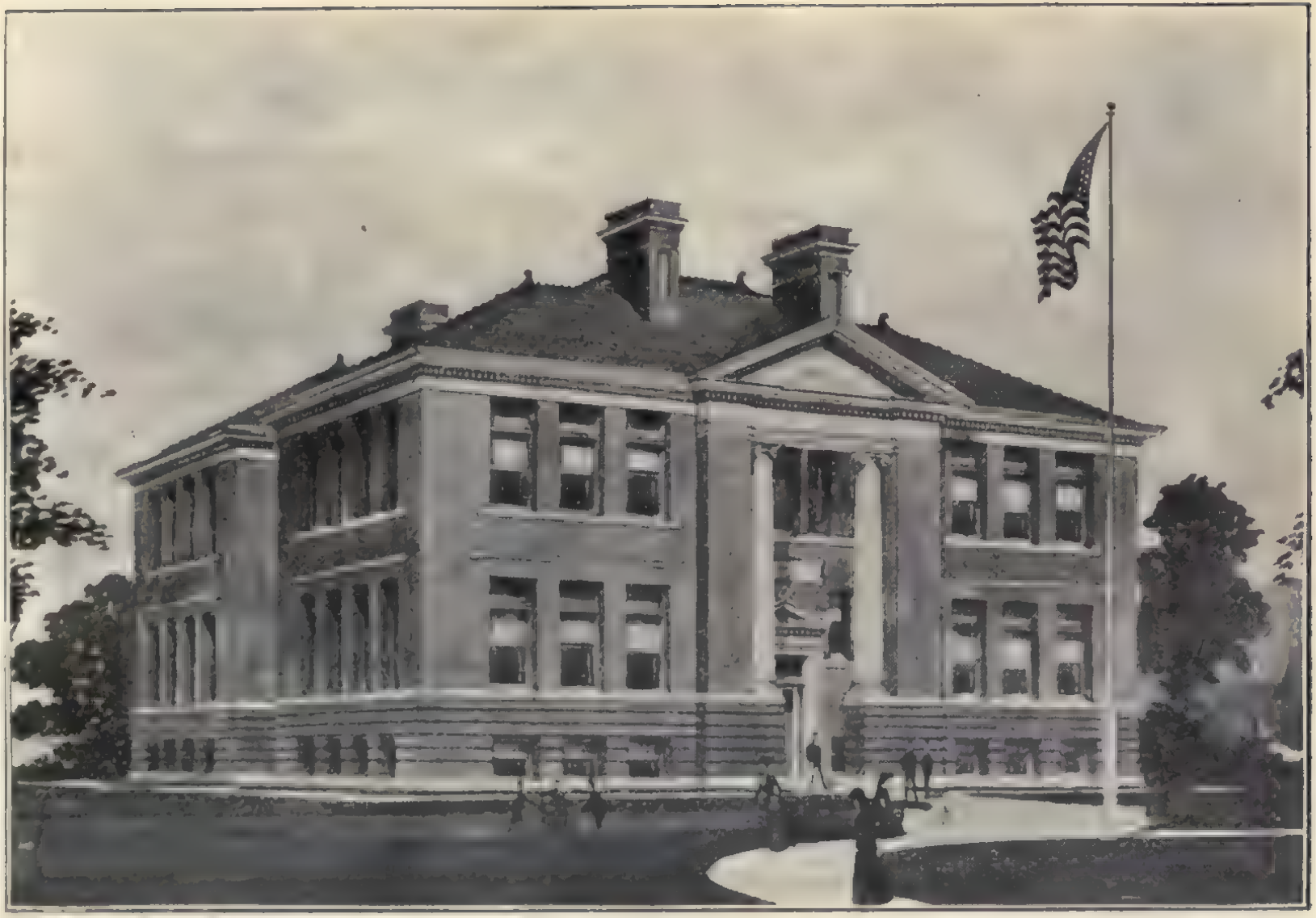
E. H. Dornette, Architect, Cincinnati, Ohio.

NEW SCHOOL, MIDDLETOWN, OHIO.

Frederick G. Mueller, Architect, Hamilton, Ohio.

THE PARKER SCHOOL, DAYTON, O.

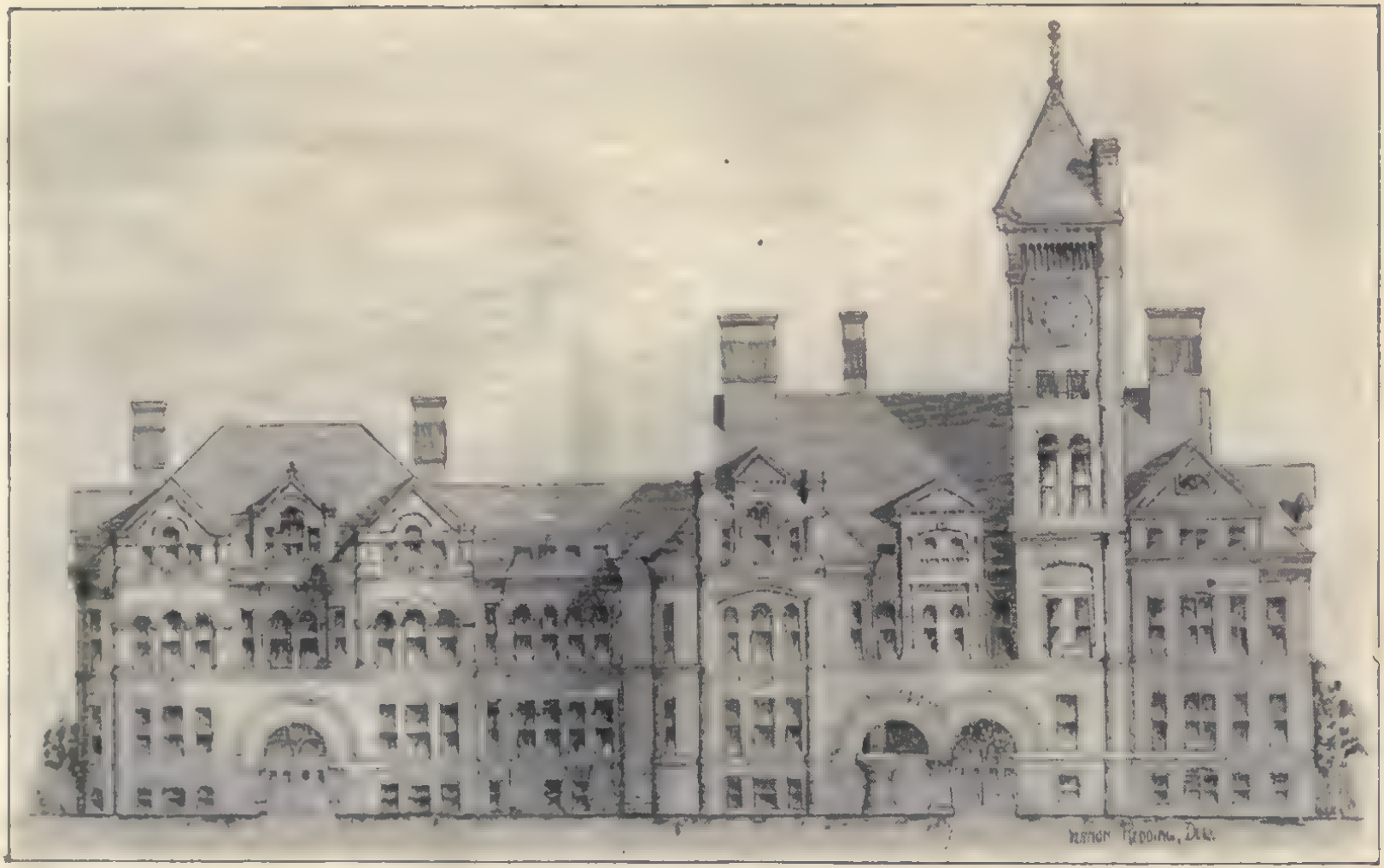
Peters, Burns & Pretzinger, Architects.



NEW CASE AVENUE SCHOOL BUILDING, NEWARK, O.
Wilbur T. Mills, Architect, Columbus, O.

THE NORMAL SCHOOL, AKRON, OHIO.

Charles Henry & Son, Architects.



HIGH SCHOOL, MANSFIELD, OHIO.

Vernon Redding, Architect.

NEW HAWTHORNE SCHOOL, INDIANAPOLIS, IND.

Clarence Martindale, Architect.

THE SLOAN SCHOOL, INDIANAPOLIS, IND.

Clarence Martindale, Architect.

THE WASHINGTON SCHOOL, LA FAYETTE, IND.
J. F. Alexander & Son, Architects.

NEW McKINLEY SCHOOL, MUNCIE, IND.

Grindle & Keeler, Architects.

PUBLIC LIBRARY, FORT WAYNE, IND.
Alfred Grindle, Architect.

PARENTAL SCHOOL, CHICAGO, ILL.
W. B. Mundie, Architect.

ONE OF THE DORMITORIES OF THE NEW CHICAGO PARENTAL SCHOOL.

W. B. Mundie, Architect.

W. K. SULLIVAN SCHOOL, CHICAGO, ILL.

W. B. Mundie, Architect.

THE ALEXANDER HAMILTON SCHOOL, CHICAGO, ILL.
W. B. Mundie, Architect.

THE HORACE MANN SCHOOL, EAST ST. LOUIS, ILL.

A. B. Frankel, Architect.

THE THOMAS McGRAW SCHOOL, DETROIT, MICH.

Malcomson & Higginbotham, Architects.

THE HERVEY C. PARKE SCHOOL, DETROIT, MICH.

Malcomson & Higginbotham, Architects.

THE NEW PARK SCHOOL, SAULT STE. MARIE, MICH.

Jas. C. Teague, Architect

THE NEW McKINLEY SCHOOL, SAULT STE. MARIE, MICH.
E. T. Root, Architect.

THE HAZELTON SCHOOL, FLINT, MICH.

Clark & Munger, Architects, Bay City, Mich.

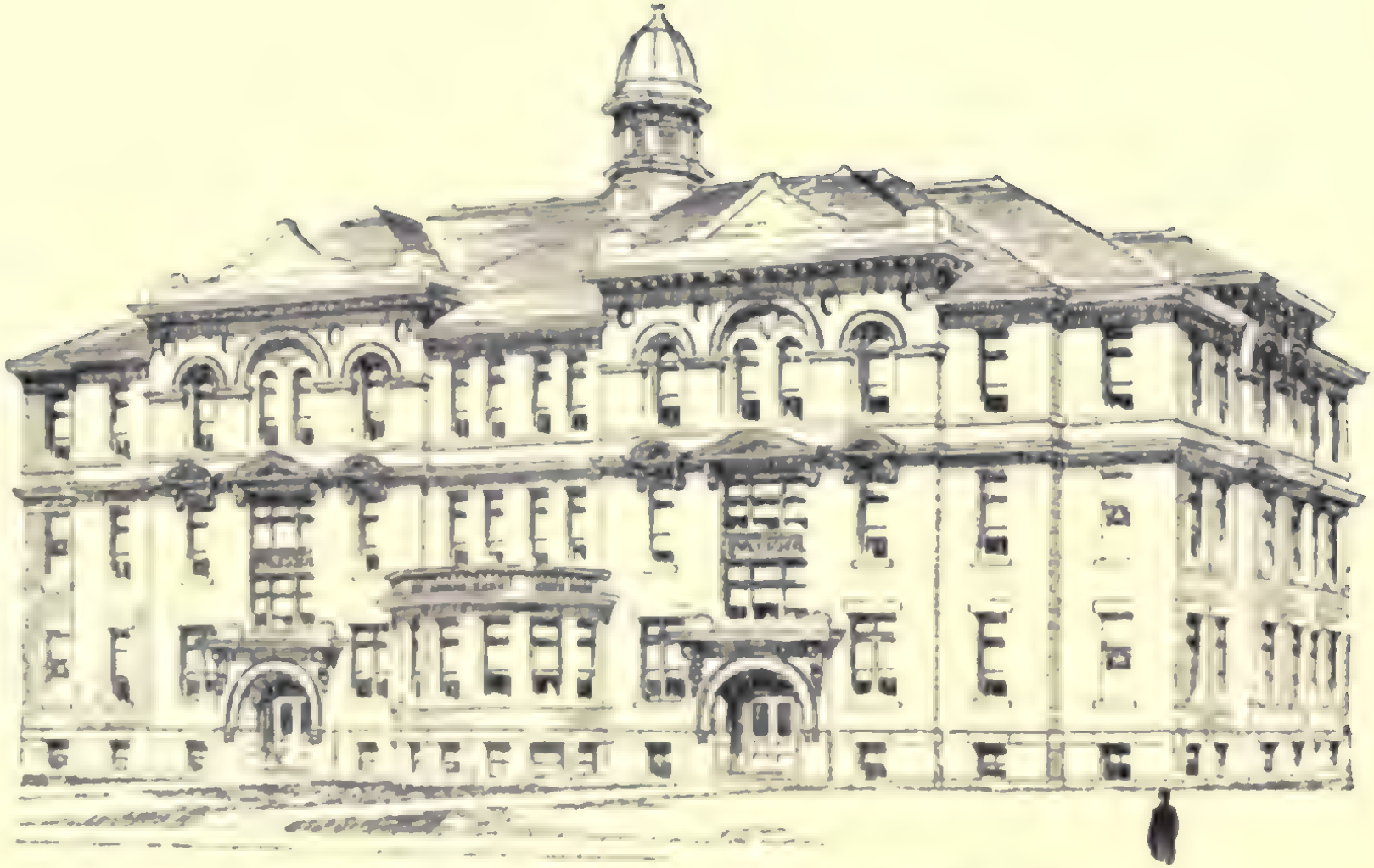
THE SAGINAW ST. SCHOOL, FLINT, MICH.
Clark & Munger, Architects, Bay City, Mich.

NEW HIGH SCHOOL, MARQUETTE, MICH.

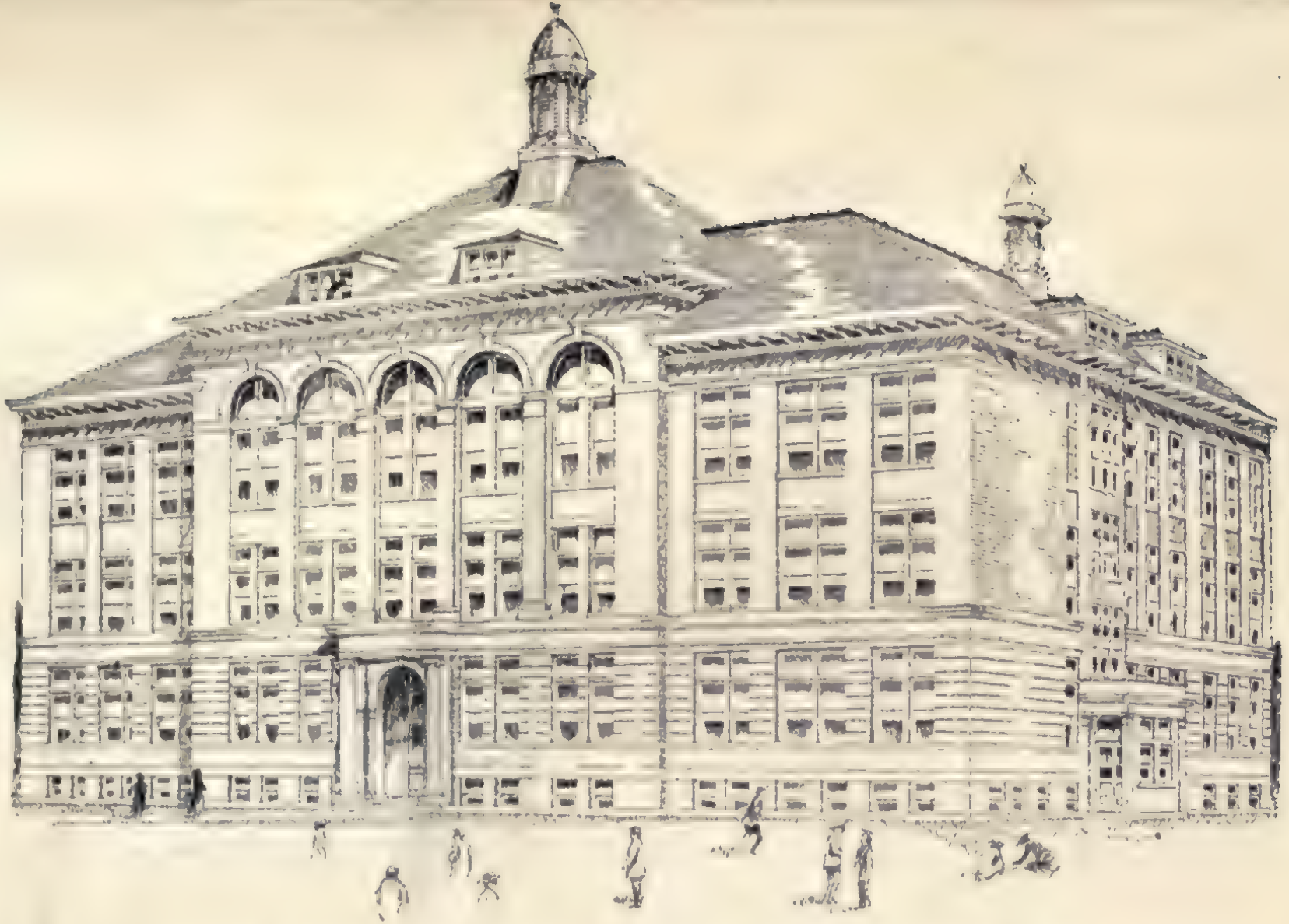
Charlton & Kuenzli, Architects.

FIFTH DISTRICT PRIMARY SCHOOL, MILWAUKEE, WIS.

Ferry & Clas, Architects.



TENTH WARD SCHOOL, MILWAUKEE, WIS.
Van Ryn & De Gelleke, Architects



NEW NINTH DISTRICT SCHOOL, MILWAUKEE, WIS.

Geo. C. Ehlers, Architect.

SOUTH DIVISION HIGH SCHOOL, MILWAUKEE, WIS.
H. C. Koch & Son, Architects.

NEW THIRTEENTH WARD SCHOOL, OSHKOSH, Wis.

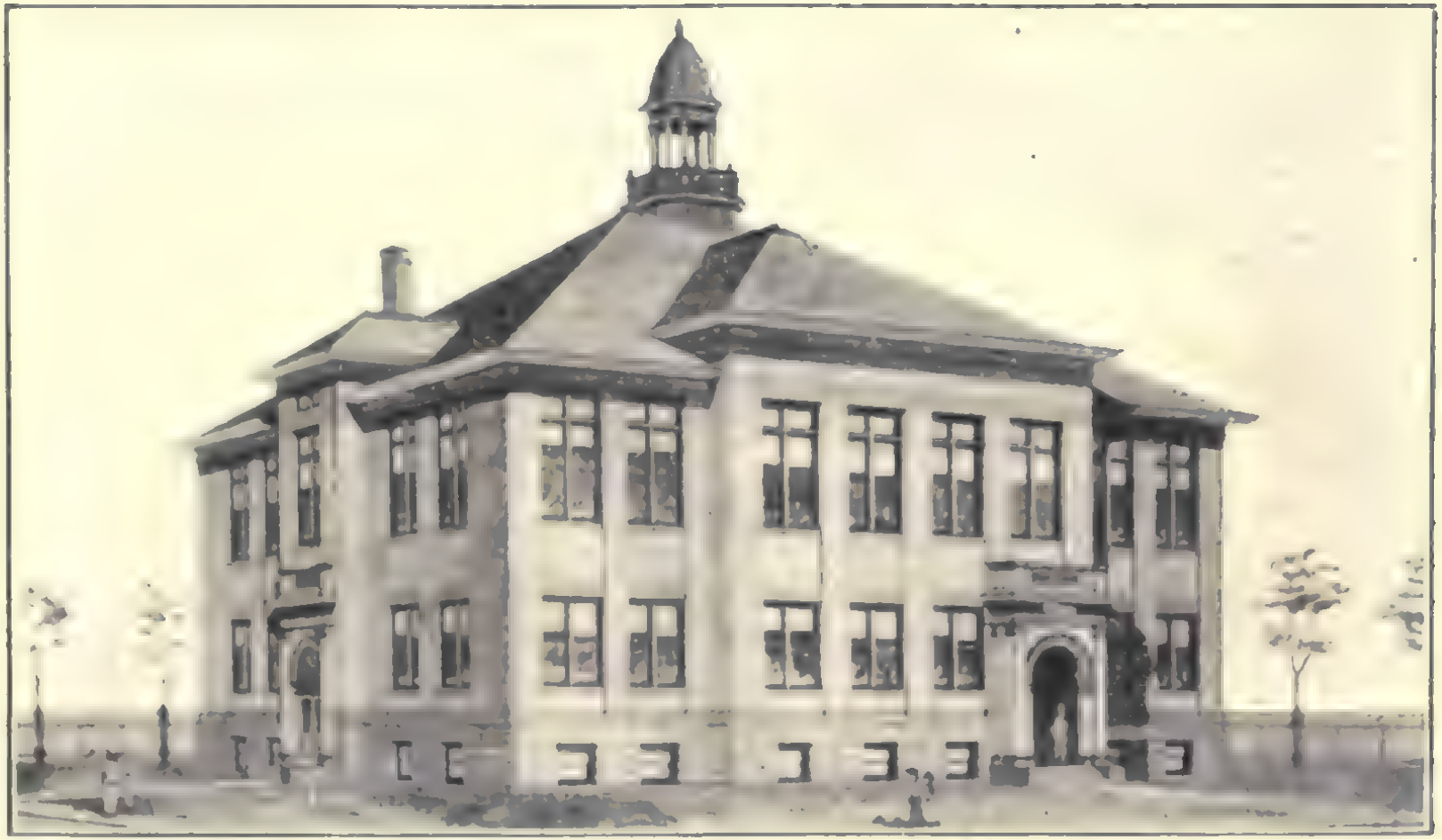
E. E. Stevens & Co., Architects, Oshkosh.

THE PUNHOGUE SCHOOL, OSHKOSH, WIS

William Waters, Architect.

NEW HIGH SCHOOL, DODGEVILLE, WIS.

Chandler and Park, Architects, Racine, Wis.

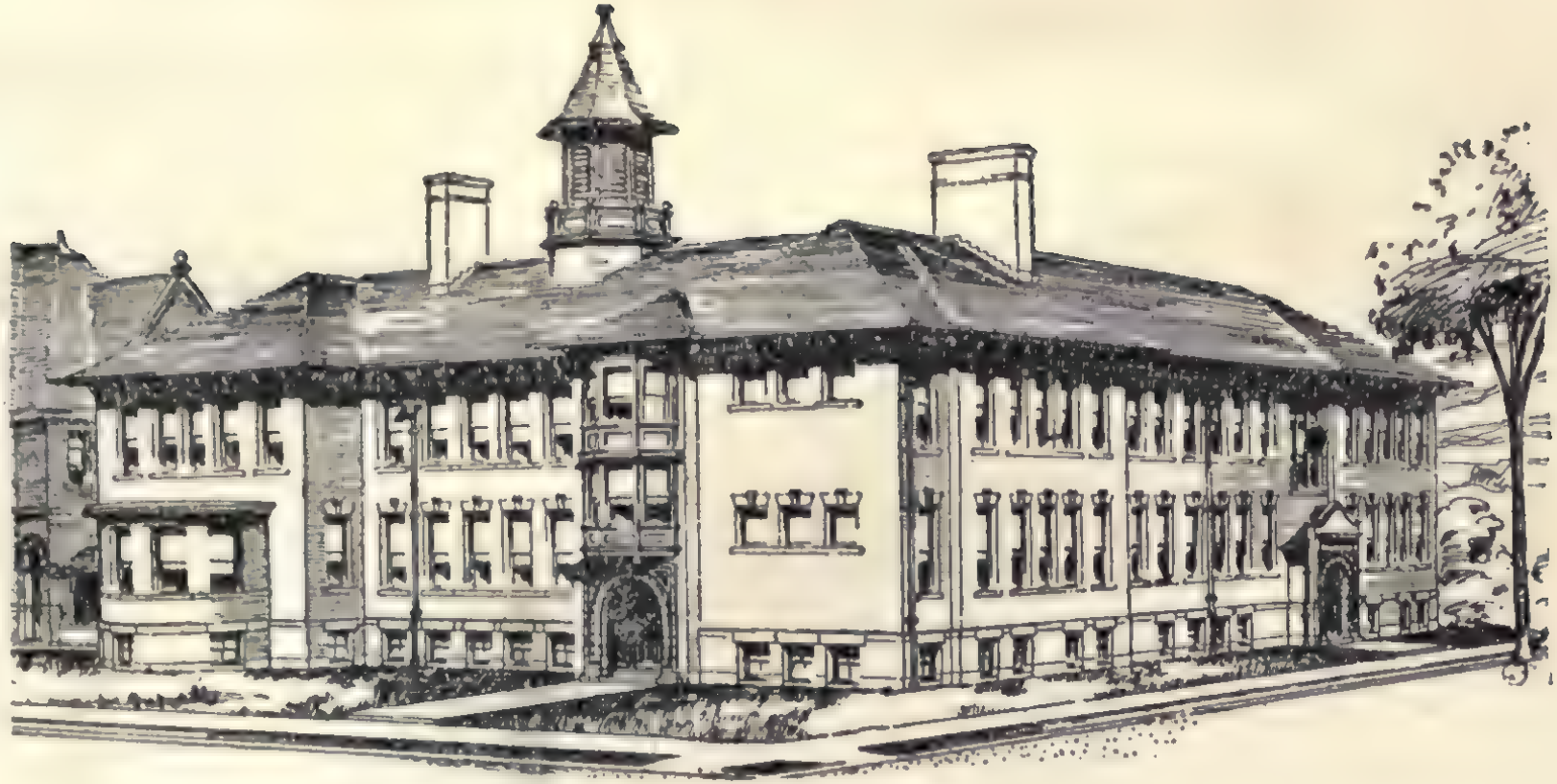


THE HIGH SCHOOL, PLYMOUTH, WIS.

Chas. Hilpertshauser, Architect, Sheboygan, Wis.

HIGH SCHOOL BUILDING, NEW RICHMOND, WIS.
W. R. Parsons & Son Co., Architects, Des Moines, Iowa.

HIGH AND GRADED SCHOOL, MENOMONIE FALLS, WIS.
Chandler & Park, Architects, Racine, Wis.



NEW PUBLIC SCHOOL, DELAVAN, WIS.

Van Ryn & De Gelleke, Architects, Milwaukee, Wis.

NEW McKINLEY SCHOOL, FOND DU LAC, WIS.

Georgenson & Pillsbury, Architects.

NEW DURKEE SCHOOL, KENOSHA, WIS.

T. Gaastra, Architect.

THE FIFTH WARD SCHOOL, SHEBOYGAN, WIS.

Chas. Hilpertshauser, Architect.

THE NEW HIGH SCHOOL, REEDSBURG, WIS.
Omeyer & Thori, Architects, St. Paul, Minn.

NEW HIGH SCHOOL, BERLIN, WIS.
Van Ryn & De Gelleke, Architects, Milwaukee, Wis.

STATE NORMAL SCHOOL, STEVENS POINT, WIS.
D. H. Perkins, Chicago, Ill.; A. D. Conover, Madison, Wis., Architects.

LABORATORY BUILDING, IOWA STATE NORMAL SCHOOL,
CEDAR FALLS, IOWA
Proudfoot & Bird, Architects, Des Moines, Ia.

NEW GYMNASIUM, IOWA STATE NORMAL SCHOOL,
CEDAR FALLS, IOWA.

Proudfoot & Bird, Architects, Des Moines, Iowa.

NEW SCHOOL, ROLLA, IOWA.

George Pass, Architect, Mankato, Minn.

THE NEW HIGH SCHOOL, PLAINVIEW, MINN.

Chandler & Park, Architects, Racine, Wis.

NEW HIGH SCHOOL, EVELETH, MINN.

W. T. Bray, Architect, Duluth, Minn

NEW HIGH SCHOOL, LESUEUR, MINN.

George Pass, Mankato,
Fremont D. Orff, Minneapolis, } Architects.

SHERIDAN SCHOOL, MINNEAPOLIS, MINN.
Carl F. Struck, Architect.

NEW CLAY SCHOOL, ST. LOUIS, MO.

Wm. B. Ittner, Architect.

NEW YEATMAN HIGH SCHOOL, ST. LOUIS, MO.

Wm. B. Ittner, Architect.

COTE BRILLIANTE SCHOOL, ST. LOUIS, MO.

Wm. B. Ittner, Architect.

WYMAN SCHOOL, ST. LOUIS, MO.

Wm. B. Ittner, Architect.

SMITH ACADEMY AND MANUAL TRAINING SCHOOL, ST. LOUIS, MO.
Mouran, Russell & Garden, Architects.

HIGH SCHOOL BUILDING, CARTHAGE, MO.

Garstang & Rea, Joplin, Mo.,
Chas. A. Smith, Kansas City, Mo., } Associate Architects.

THE NEW BENTON SCHOOL, KANSAS CITY, MO.
Charles A. Smith, Architect.

THE NEW HUMBOLDT SCHOOL, KANSAS CITY, MO.
Charles A. Smith, Architect.

THE WYATT SCHOOL, ST. JOSEPH, MO.

E. J. Eckel, Architect.

NEW CENTRAL HIGH SCHOOL, HANNIBAL, MO.
Barnett, Hayes & Barnett, Architects, St. Louis and Kansas City, Mo.

NEW HIGH SCHOOL, LEAVENWORTH, KANS.

Wm. Feth, Architect.

FRONT (West) ELEVATION, NEW SCHOOL, IOLA, KANS.

James Roberts, Architect, Iola, Kans.

THE NEW HIGH SCHOOL, OMAHA, NEB.

John Latenser, Architect.

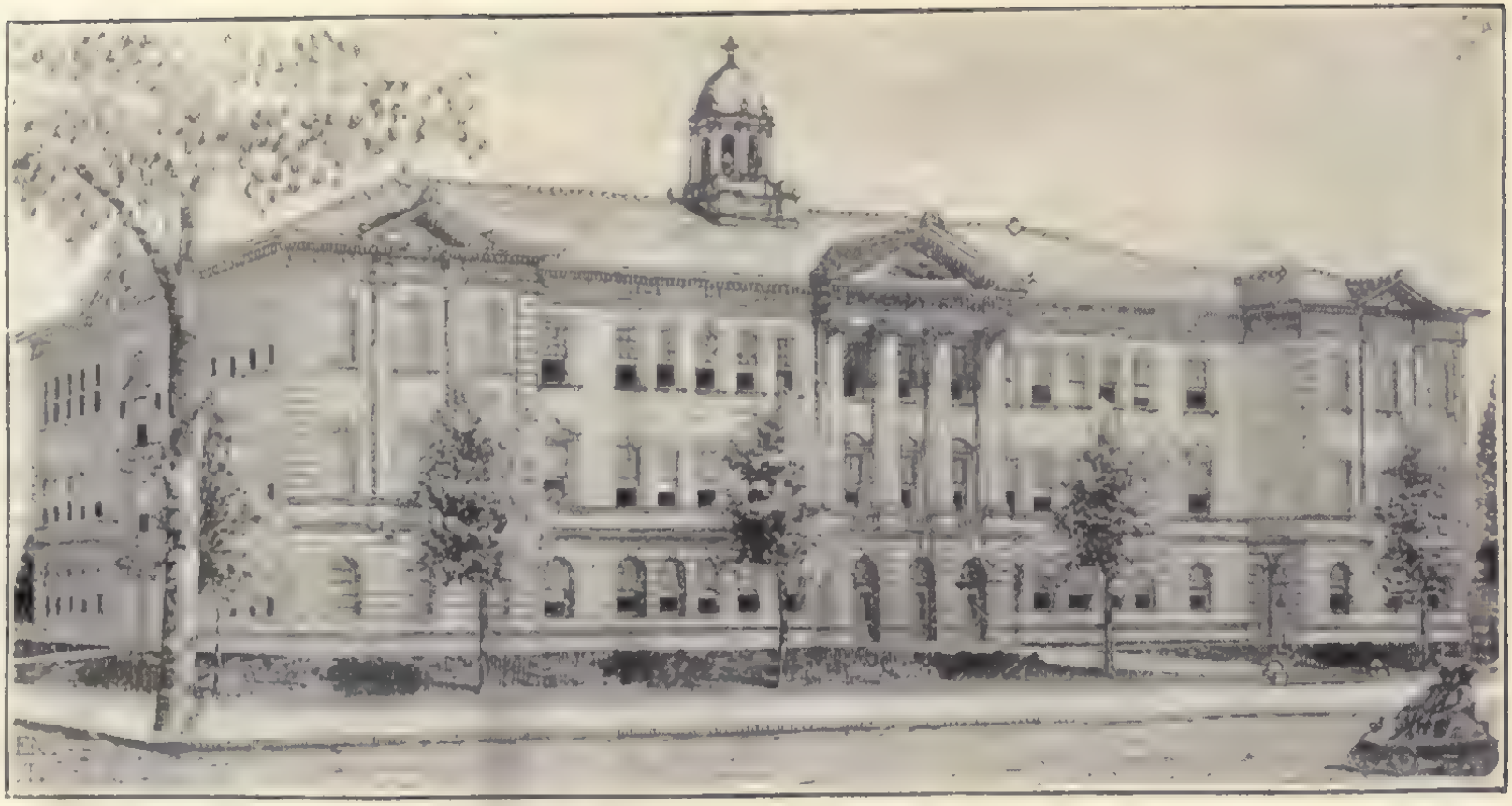
NEW HIGH SCHOOL, SOUTH OMAHA, NEB.

John Latenser, Architect, Omaha, Neb.

HIGH SCHOOL, HASTINGS, NEB.

John Latenser, Architect, Omaha, Neb.

CENTRAL HIGH SCHOOL, PUEBLO, COLO.
Robt. S. Roeschlaub & Son, Architects, Denver, Colo.



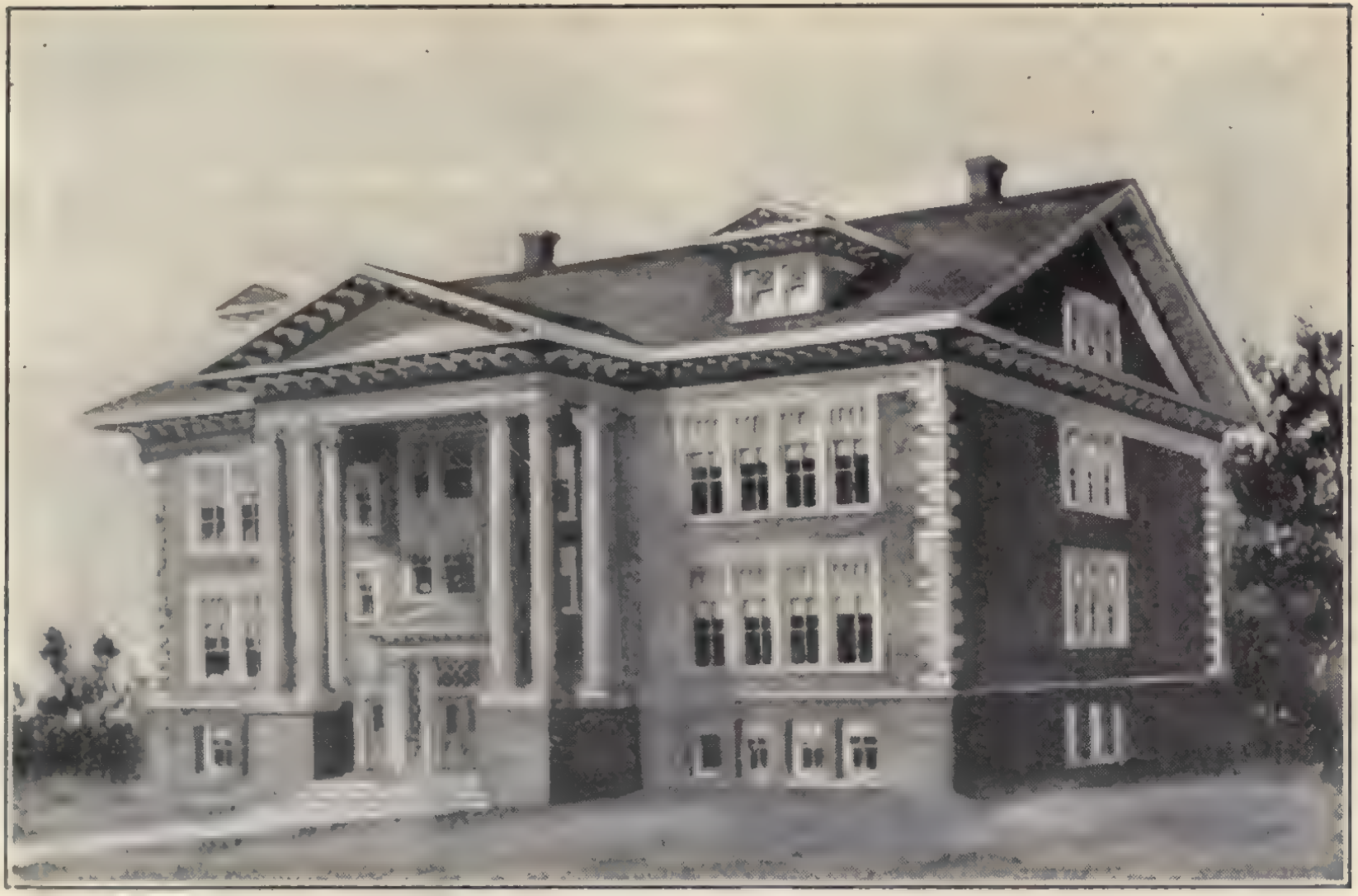
NEW BROADWAY SCHOOL, DENVER, COLO.
Frank C. Goff, Supervising Engineer; David W. Dryden, Architect.

LONGFELLOW SCHOOL, BOISE, IDAHO.
Wayland & Fennell, Architects.

CENTRAL SCHOOL, BOISE, IDAHO.

J. E. Tourtellatte & Co., Architects.

HILL TRACT SCHOOL, SEATTLE, WASH.
James Stephen, Architect.



THE NEW CAPITOL HILL SCHOOL, SEATTLE, WASH.

To be Enlarged to a 22-room Building.

James Stephen, Architect.

JOHN HAY SCHOOL, SEATTLE, WASH.

James Stephen, Architect.

SUMMIT SCHOOL, SEATTLE, WASH.

James Stephen, Architect.

NEW PARK SCHOOL, SEATTLE, WASH.

James Stephen, Architect.

NEW INTERLAKE SCHOOL, SEATTLE, WASH.

James Stephen, Architect.

NEW CASCADE SCHOOL, SEATTLE, WASH.

James Stephen, Architect.

NEW INTERBURY SCHOOL, SEATTLE, WASH.

James Stephen, Architect.

HOLMES SCHOOL BUILDING, SPOKANE, WASH.

John K. Dow, Architect.

THE WEBSTER SCHOOL, SPOKANE, WASH.
Albert Held, Architect, Spokane, Wash.

THE LINCOLN SCHOOL, SPOKANE, WASH.

Albert Held, Architect, Spokane, Wash.

NEW HIGH SCHOOL, TACOMA, WASH.

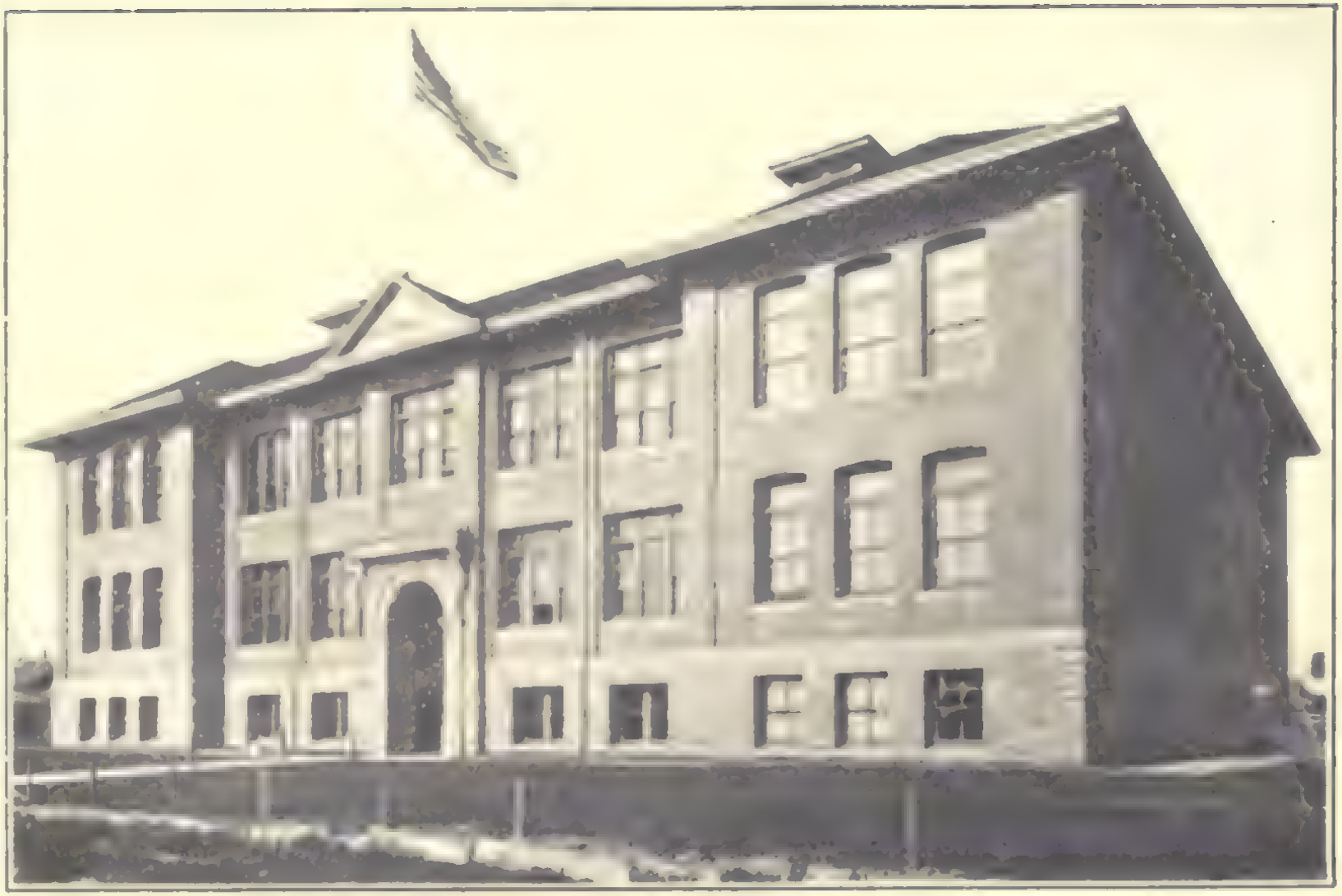
Frederick Heath, Architect.

EDISON SCHOOL, TACOMA, WASH.

Frederick Heath, Architect.

FRANKLIN SCHOOL, BELLINGHAM, WASH.

A. Lee, Architect.

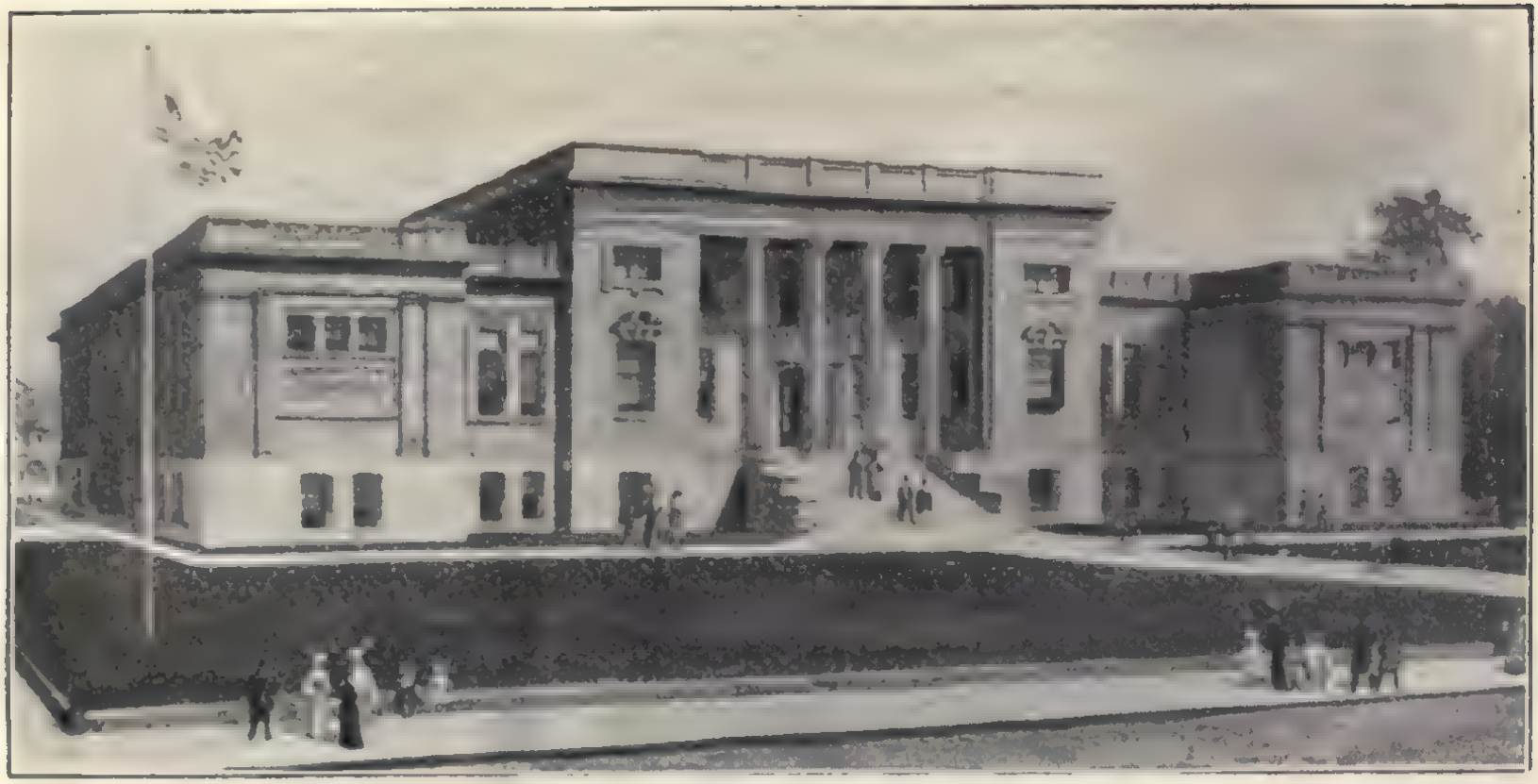


NORTH SIDE HIGH SCHOOL, BELLINGHAM, WASH.
Albert Lee, Architect.

GARFIELD SCHOOL, EVERETT, WASH.
A. F. Heide and Emil De Neuf, Architects.

NEW GRAMMAR SCHOOL, PASADENA, CAL.

Stone & Smith, Architects, San Francisco, Cal.



NEW HIGH SCHOOL, POMONA, CAL.

Stone & Smith, Architects, San Francisco, Cal.

NEW HIGH SCHOOL, POMONA, CAL.

Stone & Smith, Architects, San Francisco, Cal.

WASHINGTON GRAMMAR SCHOOL, FRESNO, CAL.

McDougall Bros., Architects.

HIGH SCHOOL, REDLANDS, CAL.

Stone & Smith, Architects, San Francisco, Cal.

NEW HIGH SCHOOL, STOCKTON, CAL.

George Rushforth, Architect.

ACCEPTED DESIGN NEW HIGH SCHOOL, SACRAMENTO, CAL.
R. A. Herold, Architect, Sacramento, Cal

The Schools in This Book

THE buildings which are illustrated in this little volume are simply a few of the several thousand school houses which have been equipped with the Johnson System of Temperature Regulation.

The list of buildings so equipped includes not only the recent and most modern public and private school buildings, but also a long list of Normal Schools, Colleges and Universities located in various parts of the United States.

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Bell Phone, Court 314

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